CERTIFICATION TEST REPORT

Report Number. : 12124122-E9V2

Applicant : APPLE INC.
1 APPLE PARK WAY
CUPERTINO, CA. 95014, U.S.A.

Model : A1921, A2103, A2104

FCC ID : BCG-E3219A

EUT Description : SMARTPHONE

Test Standard(s) : FCC CFR47 PART 27

Date Of Issue:
AUGUST 13, 2018

Prepared by:
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	8/2/2018	Initial Review	Mengistu Mekuria
V2	8/13/2018	Address TCBs Questions	Mengistu Mekuria

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1. ATTESTATION OF TEST RESULTS

Applicant Name and Address	APPLE INC. 1 APPLE PARK WAY CUPERTINO, CA. 95014, U.S.A.
Model	A1921, A2103, A2104
FCC ID	BCG-E3219A
EUT Description	SMARTPHONE
Serial Number	C39WK089K3VF
Date Tested	MARCH 28, 2018 to JUNE 11, 2018
Applicable Standards	FCC CFR47 PART 27
Test Results	COMPLIES

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.

Approved & Released By:	Prepared By:
Mengistu Mekuria	Lieu Nguyen
Lead Test Engineer	Test Engineer
UL Verification Services Inc.	UL Verification Services Inc.
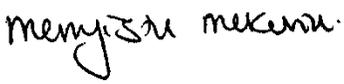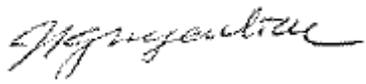
2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.26:2015, FCC CFR 47 Part 2, FCC KDB 971168 D01 v03r01/ D02 v02r01, KDB 412172 D01 v01r01, Part 27.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
☐ Chamber A (IC:2324B-1)	☐ Chamber D (IC:22541-1)
☐ Chamber B (IC:2324B-2)	☒ Chamber E (IC:22541-2)
☐ Chamber C (IC:2324B-3)	☐ Chamber F (IC:22541-3)
	☐ Chamber G (IC:22541-4)
	☐ Chamber H (IC:22541-5)

The above test sites and facilities are covered under FCC Test Firm Registration # 208313.
UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at NVLAP Lab Search.

4. CALIBRATION AND UNCERTAINTY

4.1.   MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2.   SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:
    Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) –
    Preamp Gain (dB)
    36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Radiated Disturbance,1000 to 18000 MHz	4.32 dB
Radiated Disturbance,18000 to 26000 MHz	4.45 dB
Radiated Disturbance,26000 to 40000 MHz	5.24 dB
Occupied Channel Bandwidth	±0.39 %
Temperature	±0.9 °C
Supply voltages	±0.45 %
Time	±0.02 %

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The Apple iPhone, is a smartphone with multimedia functions (music, application support, and video), cellular GSM, GPRS, EGPRS, UMTS, LTE, TD-SCDMA, CDMA, IEEE 802.11a/b/g/n/ac, Bluetooth, GPS and NFC. All models support at least one UICC based SIM. The second SIM is either UICC based, electronic SIM (e-SIM), or second SIM is not present. The device has a built-in inductive charging receiver which is not user accessible. The rechargeable battery is not user accessible.

5.2. DIFFERENCE IN MODEL NUMBER

Model A2103, A2104 is electrically identical to Model A1921. Three model numbers are allocated for marketing and logistic purposes only. A1921 was used to perform all final tests.

5.3. MAXIMUM OUTPUT POWER

ERP/EIRP LIMIT
FCC: §2.1046, §27.50

EIRP/ERP TEST PROCEDURE
ANSI C63.26:2015
KDB 971168 D01 Section 5.6
KDB 412172 D01 Determining ERP and EIRP v01r01.

ERP/EIRP = PMeas + GT − LC
where: ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as PMeas, typically dBW or dBm);
PMeas = measured transmitter output power or PSD, in dBm or dBW;
GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);
LC = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

For devices utilizing multiple antennas, KDB 662911 provides guidance for determining the effective array transmit antenna gain term to be used in the above equation.

EUT includes different power levels for head use configuration and body use configuration and the below tables contain the highest of all configurations average conducted and ERP/EIRP output powers as follows:

OUTPUT POWER FOR LTE BAND 7

Part 27 / RSS 199	
EIRP Limit (W)	2.00
Antenna Gain (dBi)	-4.50

Bandwidth (MHz)	Modulation	Low Frequency (MHz)	Upper Frequency (MHz)	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (kHz)	Emission Designator
10+20	QPSK	2505.5	2560.0	25.0	20.50	0.112	28269	28M3G7W
	16QAM			24.0	19.50	0.089	28234	28M2D7W
	64QAM			23.1	18.60	0.072	28171	28M2D7W
20+10	QPSK	2510.0	2564.5	25.0	20.50	0.112	28320	28M3G7W
	16QAM			24.0	19.50	0.089	28221	28M2D7W
	64QAM			23.2	18.70	0.074	28153	28M2D7W
15+15	QPSK	2507.5	2562.5	25.0	20.50	0.112	28788	28M8G7W
	16QAM			23.9	19.40	0.087	28748	28M7D7W
	64QAM			23.0	18.50	0.071	28588	28M6D7W
15+20	QPSK	2507.8	2560.0	25.0	20.50	0.112	33060	33M1G7W
	16QAM			24.1	19.60	0.091	33047	33M0D7W
	64QAM			23.2	18.70	0.074	32993	33M0D7W
20+15	QPSK	2510.0	2562.2	25.0	20.50	0.112	33096	33M1G7W
	16QAM			24.1	19.60	0.091	33055	33M1D7W
	64QAM			23.2	18.70	0.074	32965	33M0D7W
20+20	QPSK	2510.0	2560.0	25.0	20.50	0.112	37881	37M9G7W
	16QAM			24.0	19.50	0.089	37861	37M9D7W
	64QAM			23.4	18.90	0.078	37770	37M8D7W

OUTPUT POWER FOR LTE BAND 41

Part 27	
EIRP Limit (W)	2.00
Antenna Gain (dBi)	-4.50

Bandwidth (MHz)	Modulation	Low Frequency (MHz)	Upper Frequency (MHz)	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (kHz)	Emission Designator
5+20	QPSK	2499.3	2680.0	25.0	20.50	0.112	23483	23M5G7W
	16QAM			23.9	19.40	0.087	23484	23M5D7W
	64QAM			23.1	18.60	0.072	23434	23M4D7W
20+5	QPSK	2506.0	2686.7	25.0	20.50	0.112	28268	28M3G7W
	16QAM			24.0	19.50	0.089	28129	28M1D7W
	64QAM			23.0	18.50	0.071	28208	28M2D7W
10+20	QPSK	2501.5	2680.0	25.0	20.50	0.112	28771	28M8G7W
	16QAM			24.1	19.60	0.091	28708	28M7D7W
	64QAM			23.2	18.70	0.074	28747	28M7D7W
20+10	QPSK	2506.0	2684.5	25.0	20.50	0.112	33024	33M0G7W
	16QAM			24.0	19.50	0.089	33025	33M0D7W
	64QAM			23.0	18.50	0.071	33023	33M0D7W
15+15	QPSK	2503.5	2682.5	25.0	20.50	0.112	23481	23M5G7W
	16QAM			24.1	19.60	0.091	23401	23M4D7W
	64QAM			23.0	18.50	0.071	23354	23M4D7W
15+20	QPSK	2503.8	2680.0	25.0	20.50	0.112	28306	28M3G7W
	16QAM			24.1	19.60	0.091	28121	28M1D7W
	64QAM			23.1	18.60	0.072	27946	27M9D7W
20+15	QPSK	2506.0	2682.2	25.0	20.50	0.112	33036	33M0G7W
	16QAM			24.1	19.60	0.091	32990	33M0D7W
	64QAM			23.0	18.50	0.071	32978	33M0D7W
20+20	QPSK	2506.0	2680.0	25.0	20.50	0.112	37872	37M9G7W
	16QAM			24.0	19.50	0.089	37845	37M8D7W
	64QAM			23.0	18.50	0.071	37837	37M8D7W

5.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was version 00.28.02.

5.5. MAXIMUM ANTENNA GAIN

Please see table below:

LTE Bands	ANT 1 Antenna Gain (dBi)	ANT 2 Antenna Gain (dBi)	ANT 3 Antenna Gain (dBi)	ANT 4 Antenna Gain (dBi)
LTE Band 7, 2500 – 2570 MHz	-4.5	-4.9	-4.0	-2.6
LTE Band 38 2570 – 2620 MHz (IC)	-4.5	-5.0	-4.1	-2.4
LTE Band 41, 2496 – 2690 MHz (FCC)	-4.5	-4.9	-4.0	-2.1
LTE Band 41, 2500 – 2690 MHz (IC)	-4.5	-4.9	-4.0	-2.1

5.6. WORST-CASE CONFIGURATION AND MODE

The EUT supports LTE dual carrier Bands of: Band 7, Band 38 and Band 41.

The worst-case scenario for all measurements is based on the average conducted output power measurement investigation results. Output power measurements were measured on QPSK, 16QAM and 64QAM modulations. It was found that QPSK and 16QAM results were worst case. All testing was performed using QPSK and 16QAM modulations to represent the worst case. Tests were performed on the conducted test at Ant 1 as the worst case since it has higher output powers.

The EUT was investigated in three orthogonal orientations X/Y/Z on Port 1/2/3 and 4 antennas, it was determined that Y (Landscape) orientation was the worst-case orientation for all bands without AC/DC adapter, headphones, or laptop.

Radiated spurious emissions were investigated below 30MHz, 30MHz-1GHz and above 1GHz. There were no emissions found on below 30MHz and 30MHz-1GHz.

For simultaneous transmission of multiple channels in the 2.4GHz and Cellular bands, tests were conducted for various configurations having the highest power, least separation in frequencies and widest operation bandwidths. No noticeable new emission was found

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List			
Description	**Manufacturer**	**Model**	**Serial Number**
Laptop AC/DC adapter	Delta Electronic	A1343	ADP-85EBT V85
Laptop	Apple	MacBook Pro	73008ACB7XJ

I/O CABLES (RF Conducted Test)

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	3	US 115V	Un-shielded	2.0m	N/A
2	USB	1	DC	Un-shielded	1.0m	N/A
3	RF In/Out	1	EUT	Un-shielded	0.6m	N/A
4	RF In/Out	1	Communication Test Set	Un-shielded	1.2m	N/A
5	RF In/Out	1	Barrel	N/A	N/A	N/A

I/O CABLES (RF Radiated Test)

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	RF In/Out	1	Antenna	Un-shielded	5.0m	N/A

CONDUCTED SETUP
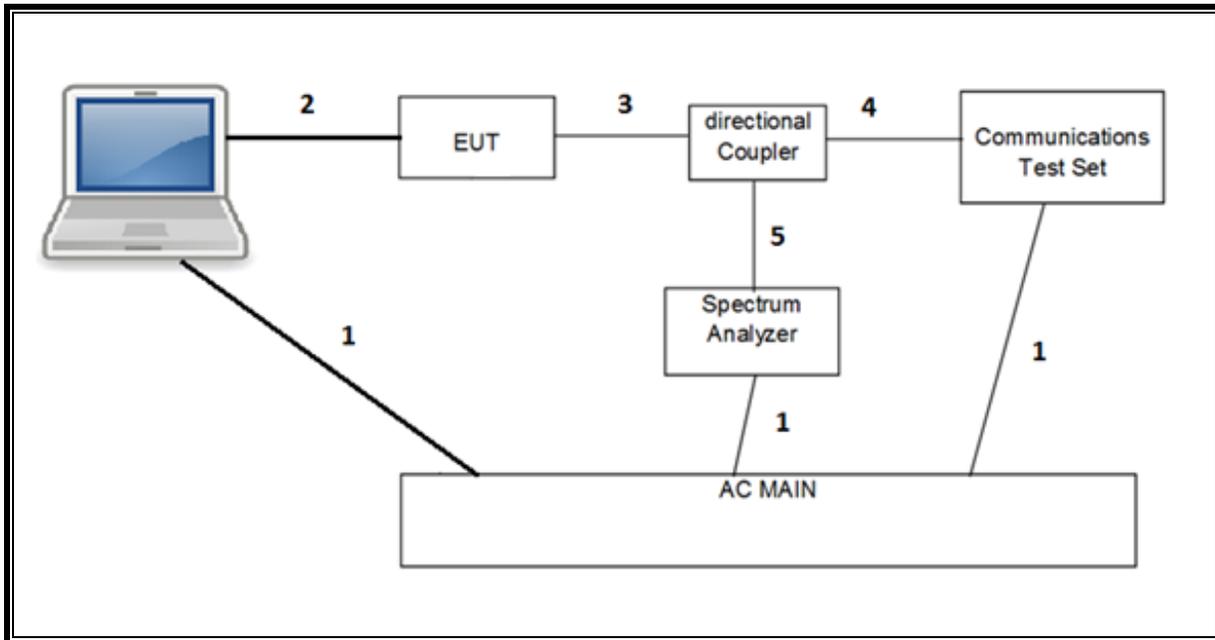
RADIATED SETUP
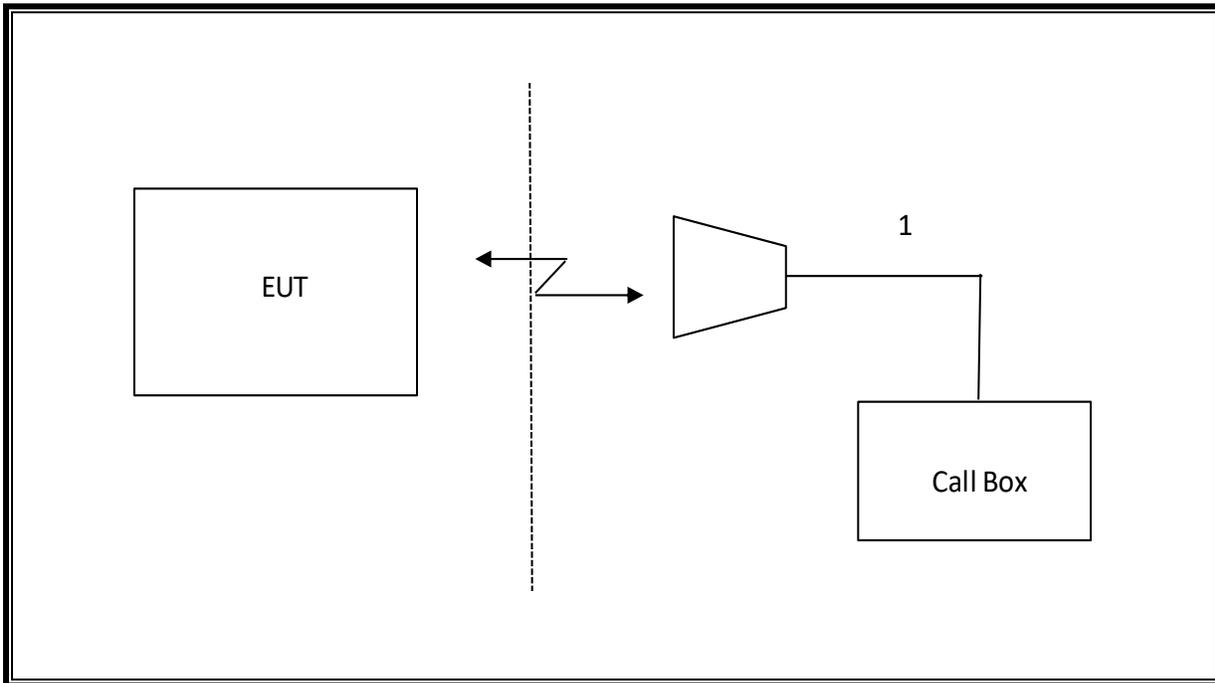
6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Asset	Cal Due
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T712	02/08/2019
*Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	T900	05/31/2018
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T741	12/30/2018
*Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T285	06/24/2018
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T906	02/16/2019
Directional Coupler	KRYTAR	152610	T1536	04/27/2019
Directional Coupler	KRYTAR	152610	T1537	04/27/2019
Spectrum Analyzer, PSA, 3Hz to 44GHz	Agilent Technologies	E4446A	T177	04/12/2019
Spectrum Analyzer, PSA, 3Hz to 44GHz	Agilent Technologies	N9030A	T339	09/13/2018
Filter, HPF 4GHz	MICROTRONICS	HPM13351	T1239	08/11/2018
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T342	02/22/2019
Chamber, Environmental	Cincinnati Sub Zero	ZPHS-8-3.5-SCT/WC	T754	09/05/2018
Chamber, Environmental	Cincinnati Sub Zero	ZPHS-8-3.5-SCT/WC	T1154	09/05/2018
Wideband Communication Test Set, Call Box	Rohde & Schwarz	CMW500	T978	08/31/2018
Wideband Communication Test Set, Call Box	Rohde & Schwarz	CMW500	T949	02/21/2019
Wideband Communication Test Set, Call Box	Rohde & Schwarz	CMW500	T959	071/8/2018
Wideband Communication Test Set, Call Box	Rohde & Schwarz	CMW500	T1871	02/19/2019
Power Meter, P-series single channel	Keysight	N1912A	T1272	05/01/2019
Power Sensor	Keysight	N1921A	T1225	04/10/2019
Wideband Communication Test Set, Call Box	Rohde & Schwarz	CMW500	T1871	02/19/2019
UL AUTOMATION SOFTWARE				
CLT Software	UL	UL RF	Ver 1.7, November 2015	
Power Measurement Software	UL	UL RF	Ver 2.2, June 2017	

Note: *Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date

7. RF OUTPUT POWER VERIFICATION

RULE PART(S)

FCC: §2.1046, §27.50

MODES TESTED

- LTE Band 7
- LTE Band 41

RESULT

EUT includes different power levels for head use configuration and body use configuration and the below tables contain the highest of all configurations average conducted output powers as follows:

7.1.   ANT1, ANT2, ANT3 and ANT4

7.1.1. LTE BAND 7

ID:	39004	Date:	5/4/18

OUTPUT POWER FOR LTE BAND 7 (10.0MHz + 20.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 1			Ant 2		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
10MHz / 20MHz	2505.5	2519.9	1	49	1	0	24.9	23.9	23.1	19.9	19.0	18.1
			50	0	100	0	22.8	21.8	22.0	17.9	16.9	17.1
	2525.6	2540.0	1	49	1	0	25.0	24.0	23.1	20.0	19.0	18.2
			50	0	100	0	23.0	21.9	22.1	17.9	17.0	17.1
	2545.6	2560.0	1	49	1	0	24.7	23.8	22.9	20.0	19.0	18.2
			50	0	100	0	22.8	21.8	22.0	18.0	17.1	17.2

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 3			Ant4		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
10MHz / 20MHz	2505.5	2519.9	1	49	1	0	24.2	23.3	22.3	19.1	18.2	17.7
			50	0	100	0	22.1	21.0	21.1	17.0	16.0	16.7
	2525.6	2540.0	1	49	1	0	24.3	23.4	22.4	19.5	18.7	18.2
			50	0	100	0	22.3	21.4	21.3	17.4	16.4	17.0
	2545.6	2560.0	1	49	1	0	24.5	23.5	22.2	19.5	18.6	18.3
			50	0	100	0	22.6	21.6	21.3	17.6	16.5	17.2

OUTPUT POWER FOR LTE BAND 7 (20.0MHz + 10.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 1			Ant 2		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz / 10MHz	2510.0	2524.4	1	99	1	0	24.9	24.0	23.2	19.8	18.8	18.0
			1	0	1	49	16.3	16.4	16.8	11.2	11.3	11.7
			100	0	50	0	22.9	21.9	22.1	17.7	16.8	17.0
	2530.1	2544.5	1	99	1	0	25.0	23.9	23.0	19.9	18.9	17.8
			1	0	1	49	16.5	16.5	16.6	11.4	11.4	11.4
			100	0	50	0	23.0	21.9	22.1	17.8	16.8	17.0
	2550.1	2564.5	1	99	1	0	24.8	23.8	23.1	20.0	18.9	18.0
			1	0	1	49	16.4	16.4	16.8	11.5	11.5	11.7
			100	0	50	0	22.9	21.8	22.1	17.9	17.0	17.1

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 3			Ant 4		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz / 10MHz	2510.0	2524.4	1	99	1	0	24.1	23.2	22.3	19.2	18.3	17.9
			1	0	1	49	15.5	15.5	15.8	10.4	10.5	11.3
			100	0	50	0	22.1	21.1	21.2	17.1	16.1	16.8
	2530.1	2544.5	1	99	1	0	**24.5**	**23.5**	**22.4**	**19.5**	**18.6**	**18.3**
			1	0	1	49	15.9	15.9	16.0	10.9	10.9	11.7
			100	0	50	0	22.3	21.3	21.3	17.4	16.4	17.1
	2550.1	2564.5	1	99	1	0	24.3	23.3	22.0	**19.5**	18.5	18.2
			1	0	1	49	16.1	16.1	16.0	11.1	11.1	11.8
			100	0	50	0	22.5	21.4	21.2	17.6	16.6	17.2

OUTPUT POWER FOR LTE BAND 7 (15.0MHz + 15.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 1			Ant 2		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
15MHz / 15MHz	2507.5	2522.5	1	74	1	0	24.8	23.8	23.0	19.8	18.8	18.1
			75	0	75	0	23.0	21.9	22.1	17.9	16.9	17.1
	2527.5	2542.5	1	74	1	0	**25.0**	**23.9**	**23.0**	20.0	19.0	**18.1**
			75	0	75	0	23.0	22.0	22.2	17.9	17.0	17.1
	2547.5	2562.5	1	74	1	0	24.8	23.8	23.0	**20.0**	**19.0**	18.0
			75	0	75	0	22.9	21.9	22.1	18.0	17.1	17.2

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 3			Ant 4		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
15MHz / 15MHz	2507.5	2522.5	1	74	1	0	24.2	23.2	**22.3**	19.0	18.1	17.9
			75	0	75	0	22.2	21.2	21.2	17.1	16.1	16.8
	2527.5	2542.5	1	74	1	0	**24.5**	**23.6**	22.3	**19.5**	**18.6**	**18.2**
			75	0	75	0	22.4	21.4	21.3	17.4	16.4	17.0
	2547.5	2562.5	1	74	1	0	24.4	23.6	22.1	19.4	18.6	18.1
			75	0	75	0	22.6	21.5	21.3	17.6	16.6	17.2

OUTPUT POWER FOR LTE BAND 7 (15.0MHz + 20.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 1			Ant 2		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
15MHz / 20MHz	2507.8	2524.9	1	74	1	0	24.8	23.8	**23.2**	19.9	18.9	**18.2**
			75	0	100	0	23.0	21.9	22.2	17.9	17.0	17.2
	2525.3	2542.4	1	74	1	0	**25.0**	**24.1**	23.2	20.0	19.1	18.2
			75	0	100	0	23.0	22.0	22.1	18.0	17.0	17.2
	2542.9	2560.0	1	74	1	0	24.8	23.9	23.1	**20.0**	**19.1**	18.2
			75	0	100	0	23.0	21.9	22.2	18.1	17.2	17.3

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm) Ant 3 QPSK	Ant 3 16QA	Ant 3 64QA	Ant 4 QPSK	Ant 4 16QA	Ant 4 64QA
15MHz / 20MHz	2507.8	2524.9	1	74	1	0	24.3	23.3	**22.5**	19.1	18.2	17.9
			75	0	100	0	22.3	21.2	21.3	17.2	16.2	16.9
	2525.3	2542.4	1	74	1	0	24.4	23.6	22.3	**19.5**	**18.7**	**18.3**
			75	0	100	0	22.4	21.5	21.4	17.5	16.5	17.2
	2542.9	2560.0	1	74	1	0	**24.5**	**23.6**	22.3	19.4	18.5	18.2
			75	0	100	0	22.7	21.7	21.4	17.7	16.6	17.3

OUTPUT POWER FOR LTE BAND 7 (20.0MHz + 15.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm) Ant 1 QPSK	Ant 1 16QA	Ant 1 64QA	Ant 2 QPSK	Ant 2 16QA	Ant 2 64QA
20MHz / 15MHz	2510.0	2527.1	1	99	1	0	25.0	**24.1**	**23.2**	19.9	18.8	18.0
			100	0	75	0	23.0	22.0	22.2	17.9	16.9	17.1
	2527.6	2544.7	1	99	1	0	**25.0**	24.1	23.0	19.9	18.9	**18.0**
			100	0	75	0	23.1	22.1	22.2	17.9	16.9	17.1
	2545.1	2562.2	1	99	1	0	24.8	23.9	23.1	**20.0**	**19.0**	18.0
			100	0	75	0	23.0	22.0	22.3	18.0	17.1	17.2

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm) Ant 3 QPSK	Ant 3 16QA	Ant 3 64QA	Ant 4 QPSK	Ant 4 16QA	Ant 4 64QA
20MHz / 15MHz	2510.0	2527.1	1	99	1	0	24.2	23.3	22.3	19.1	18.2	17.8
			100	0	75	0	22.3	21.3	21.3	17.2	16.1	16.9
	2527.6	2544.7	1	99	1	0	**24.5**	**23.6**	**22.4**	**19.5**	**18.5**	**18.1**
			100	0	75	0	22.5	21.5	21.3	17.4	16.4	17.1
	2545.1	2562.2	1	99	1	0	24.5	23.6	22.2	19.4	18.5	18.1
			100	0	75	0	22.7	21.6	21.4	17.6	16.5	17.2

OUTPUT POWER FOR LTE BAND 7 (20.0MHz + 20.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB Size	PCC RB Offset	SCC1 RB Size	SCC1 RB Offset	Conducted Average (dBm) Ant 1 QPSK	Ant 1 16QA	Ant 1 64QA	Ant 2 QPSK	Ant 2 16QA	Ant 2 64QA
20MHz/ 20MHz	2510.0	2529.8	1	99	1	0	**25.0**	**24.0**	**23.4**	19.9	18.9	**18.2**
			1	0	1	99	16.1	16.2	16.6	11.2	11.2	11.7
			100	0	100	0	23.1	22.0	22.3	18.0	17.0	17.2
	2525.1	2544.9	1	99	1	0	25.0	24.0	23.3	**20.0**	**19.0**	18.2
			1	0	1	99	16.2	16.3	16.6	11.3	11.3	11.5
			100	0	100	0	23.1	22.0	22.3	17.9	17.0	17.1
	2540.2	2560.0	1	99	1	0	24.8	23.8	23.1	20.0	18.9	18.2
			1	0	1	99	16.2	16.2	16.5	11.3	11.3	11.5
			100	0	100	0	23.0	22.0	22.2	18.1	17.1	17.2

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 3			Ant 4		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz/ 20MHz	2510.0	2529.8	1	99	1	0	24.2	23.3	22.5	19.2	18.3	18.0
			1	0	1	99	15.4	15.4	15.6	10.3	10.3	11.2
			100	0	100	0	22.2	21.2	21.3	17.3	16.2	17.0
	2525.1	2544.9	1	99	1	0	**24.5**	**23.5**	**22.5**	**19.5**	**18.6**	**18.3**
			1	0	1	99	15.7	15.7	15.8	10.7	10.7	11.4
			100	0	100	0	22.4	21.4	21.3	17.5	16.4	17.2
	2540.2	2560.0	1	99	1	0	24.4	23.5	22.2	19.4	18.4	18.2
			1	0	1	99	15.9	15.8	15.7	10.7	10.8	11.4
			100	0	100	0	22.6	21.5	21.3	17.5	16.5	17.2

7.1.2. LTE BAND 41

ID:	39004	Date:	5/4/18

OUTPUT POWER FOR LTE BAND 41 (5.0MHz + 20.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 1			Ant 2		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
5MHz / 20MHz	2499.3	2511.0	1	24	1	0	**25.0**	**23.9**	23.1	22.1	21.0	20.5
			25	0	100	0	23.2	22.2	22.2	20.2	19.2	19.6
	2583.8	2595.5	1	24	1	0	24.9	23.8	22.7	22.1	21.0	20.1
			25	0	100	0	23.1	22.1	21.9	20.1	19.3	19.5
	2668.3	2680.0	1	24	1	0	24.6	23.5	**23.1**	**22.2**	**21.3**	**20.8**
			25	0	100	0	22.3	21.3	21.5	19.8	18.9	19.3

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 3			Ant 4		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
5MHz / 20MHz	2499.3	2511.0	1	24	1	0	24.5	**23.6**	**22.9**	22.3	21.3	20.4
			25	0	100	0	22.4	21.5	21.6	20.0	19.1	19.1
	2583.8	2595.5	1	24	1	0	24.1	23.4	22.5	22.3	21.2	20.4
			25	0	100	0	22.9	21.9	21.7	20.2	19.3	19.5
	2668.3	2680.0	1	24	1	0	**24.5**	23.6	22.9	**22.5**	**21.6**	**21.1**
			25	0	100	0	22.6	21.7	21.7	20.3	19.4	19.5

OUTPUT POWER FOR LTE BAND 41 (20.0MHz + 5.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 1			Ant 2		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz / 5MHz	2506.0	2517.7	1	99	1	0	**25.0**	**24.0**	**23.0**	22.2	21.2	**20.6**
			1	0	1	24	17.8	17.2	17.0	13.6	14.0	14.6
			100	0	25	0	22.9	22.0	21.8	20.1	19.2	19.5
	2590.5	2602.2	1	99	1	0	24.7	23.8	22.7	**22.2**	**21.3**	20.5
			1	0	1	24	16.7	16.8	16.3	14.6	13.9	14.0
			100	0	25	0	22.6	21.7	21.5	20.0	19.2	19.4
	2675.0	2686.7	1	99	1	0	24.1	23.1	22.6	22.0	21.1	20.5
			1	0	1	24	15.3	15.8	16.6	14.2	13.6	13.9
			100	0	25	0	21.9	20.8	21.0	19.7	18.8	19.1

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 3			Ant 4		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz / 5MHz	2506.0	2517.7	1	99	1	0	24.1	23.2	22.4	**22.5**	**21.6**	20.5
			1	0	1	24	16.6	15.8	15.8	14.0	14.4	14.3
			100	0	25	0	22.3	21.3	21.4	20.4	19.4	19.4
	2590.5	2602.2	1	99	1	0	**24.5**	**23.6**	**22.5**	22.4	21.6	**20.8**
			1	0	1	24	17.0	16.0	16.9	13.7	13.8	14.0
			100	0	25	0	22.4	21.4	21.3	20.4	19.5	19.6
	2675.0	2686.7	1	99	1	0	24.2	23.3	22.5	22.5	21.6	20.9
			1	0	1	24	15.6	17.3	16.1	14.6	13.6	13.9
			100	0	25	0	22.2	21.1	21.1	20.4	19.2	19.5

OUTPUT POWER FOR LTE BAND 41 (10.0MHz + 20.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 1			Ant 2		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
10MHz / 20MHz	2501.5	2515.9	1	49	1	0	**25.0**	**24.1**	**23.2**	**22.2**	**21.1**	20.7
			50	0	100	0	22.9	21.9	21.8	19.9	19.1	19.5
	2583.6	2598.0	1	49	1	0	24.8	23.7	22.8	22.1	21.1	20.4
			50	0	100	0	22.7	21.7	21.5	19.9	19.0	19.2
	2665.6	2680.0	1	49	1	0	24.3	23.2	22.9	22.0	21.0	**20.7**
			50	0	100	0	22.0	20.9	21.2	19.6	18.7	19.1

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 3			Ant 4		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
10MHz / 20MHz	2501.5	2515.9	1	49	1	0	24.2	23.1	22.5	22.4	21.4	20.9
			50	0	100	0	22.0	20.9	21.1	19.9	19.0	19.3
	2583.6	2598.0	1	49	1	0	**24.5**	**23.5**	22.5	22.5	21.4	20.9
			50	0	100	0	22.3	21.3	21.2	20.2	19.3	19.7
	2665.6	2680.0	1	49	1	0	24.2	23.3	**22.6**	**22.5**	**21.6**	**21.3**
			50	0	100	0	22.1	21.1	21.2	20.3	19.3	19.7

OUTPUT POWER FOR LTE BAND 41 (20.0MHz + 10.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 1			Ant 2		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz / 10MHz	2506.0	2520.4	1	99	1	0	**25.0**	**24.0**	**23.0**	22.1	21.1	**20.4**
			100	0	50	0	22.9	21.9	21.8	19.9	19.0	19.4
	2588.1	2602.5	1	99	1	0	24.8	23.8	22.7	**22.2**	**21.2**	20.4
			100	0	50	0	22.6	21.7	21.4	19.9	19.0	19.2
	2670.1	2684.5	1	99	1	0	24.1	23.3	22.6	21.8	20.9	20.4
			100	0	50	0	21.9	20.9	21.2	19.6	18.6	19.0

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 3			Ant 4		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz / 10MHz	2506.0	2520.4	1	99	1	0	24.2	23.2	22.4	22.3	21.5	20.7
			100	0	50	0	22.1	21.1	21.3	20.2	19.2	19.5
	2588.1	2602.5	1	99	1	0	**24.5**	**23.6**	22.5	22.4	21.5	21.0
			100	0	50	0	22.3	21.3	21.2	20.2	19.3	19.7
	2670.1	2684.5	1	99	1	0	24.3	23.4	**22.5**	**22.5**	**21.6**	**21.1**
			100	0	50	0	22.1	21.1	21.2	20.2	19.3	19.7

OUTPUT POWER FOR LTE BAND 41 (15.0MHz + 15.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 1			Ant 2		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
15MHz / 15MHz	2503.5	2518.5	1	74	1	0	**25.0**	**24.1**	**23.0**	22.1	21.0	**20.4**
			75	0	75	0	22.9	22.0	21.9	19.9	19.1	19.4
	2585.5	2600.5	1	74	1	0	24.9	24.0	22.7	**22.2**	**21.1**	20.3
			75	0	75	0	22.8	21.8	21.5	19.9	19.0	19.2
	2667.5	2682.5	1	74	1	0	24.3	23.3	22.5	21.9	20.8	20.2
			75	0	75	0	22.0	21.0	21.3	19.6	18.6	19.0

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 3			Ant 4		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
15MHz / 15MHz	2503.5	2518.5	1	74	1	0	24.2	23.2	22.3	22.4	21.3	20.6
			75	0	75	0	22.0	21.0	21.2	20.1	19.1	19.4
	2585.5	2600.5	1	74	1	0	**24.5**	**23.7**	22.4	**22.5**	21.6	20.8
			75	0	75	0	22.3	21.3	21.1	20.2	19.3	19.7
	2667.5	2682.5	1	74	1	0	24.3	23.5	**22.4**	22.4	**21.6**	**20.9**
			75	0	75	0	22.1	21.1	21.1	20.2	19.2	19.7

OUTPUT POWER FOR LTE BAND 41 (15.0MHz + 20.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 1			Ant 2		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
15MHz / 20MHz	2503.8	2520.9	1	74	1	0	**25.0**	**24.1**	**23.1**	22.1	21.1	**20.4**
			75	0	100	0	22.9	21.9	21.9	19.8	19.0	19.3
	2583.3	2600.4	1	74	1	0	24.9	24.0	22.8	**22.2**	**21.3**	20.2
			75	0	100	0	22.7	21.7	21.5	19.9	19.0	19.1
	2662.9	2680.0	1	74	1	0	24.2	23.2	22.4	21.8	20.9	20.1
			75	0	100	0	22.0	21.0	21.2	19.6	18.6	19.0

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 3			Ant 4		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
15MHz / 20MHz	2503.8	2520.9	1	74	1	0	24.2	23.3	22.3	22.3	21.3	20.5
			75	0	100	0	21.9	20.9	21.1	20.0	19.0	19.3
	2583.3	2600.4	1	74	1	0	**24.5**	**23.6**	**22.3**	**22.5**	**21.6**	20.8
			75	0	100	0	22.2	21.3	21.1	20.2	19.2	19.6
	2662.9	2680.0	1	74	1	0	24.2	23.4	22.3	22.4	21.5	**20.8**
			75	0	100	0	22.1	21.1	21.1	20.2	19.2	19.6

OUTPUT POWER FOR LTE BAND 41 (20.0MHz + 15.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 1			Ant 2		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz / 15MHz	2506.0	2523.1	1	99	1	0	25.0	24.1	23.0	22.2	21.1	20.3
			100	0	75	0	22.9	21.9	21.8	19.8	18.9	19.2
	2585.6	2602.7	1	99	1	0	24.8	24.0	22.8	22.0	21.1	20.2
			100	0	75	0	22.7	21.7	21.5	19.7	18.9	19.1
	2665.1	2682.2	1	99	1	0	24.1	23.2	22.6	21.7	20.8	20.2
			100	0	75	0	22.0	21.0	21.2	19.4	18.5	18.9

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 3			Ant 4		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz / 15MHz	2506.0	2523.1	1	99	1	0	24.1	23.2	22.2	22.4	21.7	20.8
			100	0	75	0	22.0	21.0	21.2	20.2	19.2	19.5
	2585.6	2602.7	1	99	1	0	24.5	23.6	22.4	22.5	21.7	20.9
			100	0	75	0	22.3	21.3	21.1	20.3	19.3	19.7
	2665.1	2682.2	1	99	1	0	24.2	23.3	18.4	22.5	21.6	17.0
			100	0	75	0	22.1	21.1	21.1	20.3	19.3	19.7

OUTPUT POWER FOR LTE BAND 41 (20.0MHz + 20.0MHz)

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 1			Ant 2		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz/ 20MHz	2506.0	2525.8	1	99	1	0	25.0	24.0	23.0	22.2	21.2	20.6
			1	0	1	99	16.1	16.3	16.1	13.4	13.5	13.7
			100	0	100	0	22.9	21.9	21.8	20.0	19.1	19.4
	2583.1	2602.9	1	99	1	0	24.8	23.9	22.7	22.2	21.3	20.5
			1	0	1	99	16.0	16.1	16.0	13.3	13.4	13.6
			100	0	100	0	22.6	21.6	21.5	20.0	19.1	19.3
	2660.2	2680.0	1	99	1	0	24.1	23.2	22.6	21.9	20.9	20.4
			1	0	1	99	15.2	15.4	15.7	13.0	13.0	13.4
			100	0	100	0	21.9	20.9	21.2	19.7	18.7	19.1

Bandwidth	PCC Frequency (MHz)	SCC1 Frequency (MHz)	PCC RB	PCC RB	SCC1 RB	SCC1 RB	Conducted Average (dBm)					
							Ant 3			Ant 4		
			Size	Offset	Size	Offset	QPSK	16QA	64QA	QPSK	16QA	64QA
20MHz/ 20MHz	2506.0	2525.8	1	99	1	0	24.1	23.2	22.4	22.3	21.5	20.8
			1	0	1	99	15.0	15.3	15.4	13.1	13.2	13.5
			100	0	100	0	22.0	20.9	21.1	20.1	19.1	19.3
	2583.1	2602.9	1	99	1	0	24.5	23.6	22.5	22.5	21.6	20.9
			1	0	1	99	15.9	15.9	15.8	13.6	13.7	13.9
			100	0	100	0	22.3	21.3	21.1	20.2	19.3	19.7
	2660.2	2680.0	1	99	1	0	24.3	23.4	22.5	22.4	21.5	21.1
			1	0	1	99	15.5	15.5	15.8	13.6	13.6	14.1
			100	0	100	0	22.0	21.1	21.1	20.3	19.2	19.7

8. CONDUCTED TEST RESULTS

8.1. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §2.1049

LIMITS

For reporting purposes only

TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the middle channel in each band. The 99% and -26dB bandwidths was also measured and recorded.

MODES TESTED

- LTE Band 7
- LTE Band 41

RESULTS

There is no limit required and power is the same for low, middle and high channel; therefore, only middle channel was tested

LTE BAND 7

Band	Mode	RB Allocation/RB Offset	f (MHz)	99% BW (MHz)	- 26dB BW (MHz)
LTE BAND 7	10MHz + 20MHz BAND QPSK	50/0 + 100/0	2535	28.269	31.22
	10MHz + 20MHz BAND 16QAM			28.234	31.11
	10MHz + 20MHz BAND 64QAM			28.171	31.00
	20MHz + 10MHz BAND QPSK	100/0 + 50/0		28.320	31.38
	20MHz + 10MHz BAND 16QAM			28.221	31.25
	20MHz + 10MHz BAND 64QAM			28.153	31.11
	15MHz + 15MHz BAND QPSK	75/0 + 75/0		28.788	31.68
	15MHz + 15MHz BAND 16QAM			28.748	31.55
	15MHz + 15MHz BAND 64QAM			28.588	31.56
	15MHz + 20MHz BAND QPSK	75/0 + 100/0		33.060	36.26
	15MHz + 20MHz BAND 16QAM			33.047	36.38
	15MHz + 20MHz BAND 64QAM			32.993	35.94
	20MHz + 15MHz BAND QPSK	100/0 + 75/0		33.096	36.31
	20MHz + 15MHz BAND 16QAM			33.055	36.45
	20MHz + 15MHz BAND 64QAM			32.965	36.24
	20MHz + 20MHz BAND QPSK	100/0 + 100/0		37.881	41.85
	20MHz + 20MHz BAND 16QAM			37.861	41.70
	20MHz + 20MHz BAND 64QAM			37.770	41.69

LTE BAND 41

Band	Mode	RB Allocation/RB Offset	f (MHz)	99% BW (MHz)	- 26dB BW (MHz)
LTE BAND 41 (FCC)	5MHz + 20MHz BAND QPSK	25/0 + 100/0	2593	23.483	32.50
	5MHz + 20MHz BAND 16QAM			23.484	33.88
	5MHz + 20MHz BAND 64QAM			23.434	26.92
	10MHz + 20MHz BAND QPSK	50/0 + 100/0		28.268	36.03
	10MHz + 20MHz BAND 16QAM			28.129	37.28
	10MHz + 20MHz BAND 64QAM			28.208	30.63
	15MHz + 15MHz BAND QPSK	75/0 + 75/0		28.771	38.28
	15MHz + 15MHz BAND 16QAM			28.708	38.66
	15MHz + 15MHz BAND 64QAM			28.747	39.27
	15MHz + 20MHz BAND QPSK	75/0 + 100/0		33.024	42.79
	15MHz + 20MHz BAND 16QAM			33.025	41.03
	15MHz + 20MHz BAND 64QAM			33.023	37.89
	20MHz + 5MHz BAND QPSK	100/0 + 25/0		23.481	27.61
	20MHz + 5MHz BAND 16QAM			23.401	27.43
	20MHz + 5MHz BAND 64QAM			23.354	27.12
	20MHz + 10MHz BAND QPSK	100/0 + 50/0		28.306	33.76
	20MHz + 10MHz BAND 16QAM			28.121	34.69
	20MHz + 10MHz BAND 64QAM			27.946	30.16
	20MHz + 15MHz BAND QPSK	100/0 + 75/0		33.036	42.30
	20MHz + 15MHz BAND 16QAM			32.990	40.07
	20MHz + 15MHz BAND 64QAM			32.978	40.07
	20MHz + 20MHz BAND QPSK	100/0 + 100/0		37.872	50.37
	20MHz + 20MHz BAND 16QAM			37.845	49.32
	20MHz + 20MHz BAND 64QAM			37.837	45.59

8.1.1. LTE BAND 7
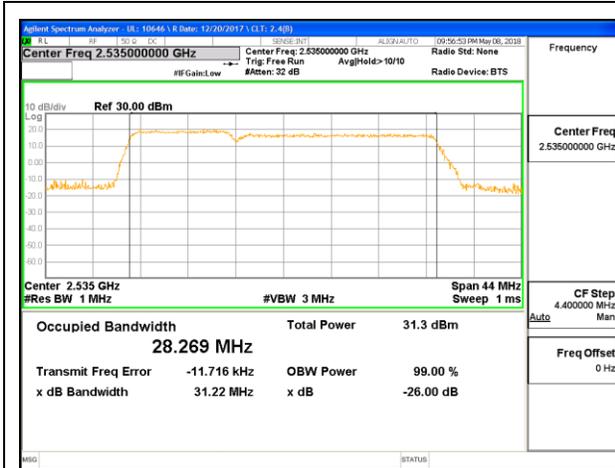
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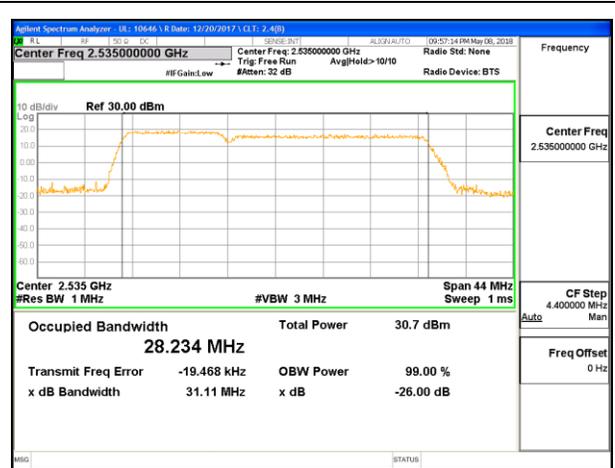
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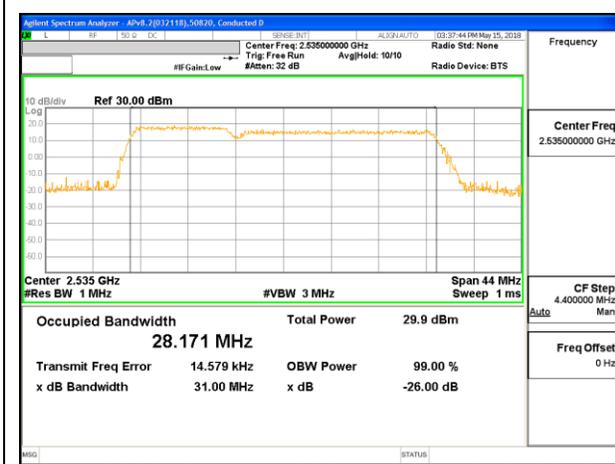
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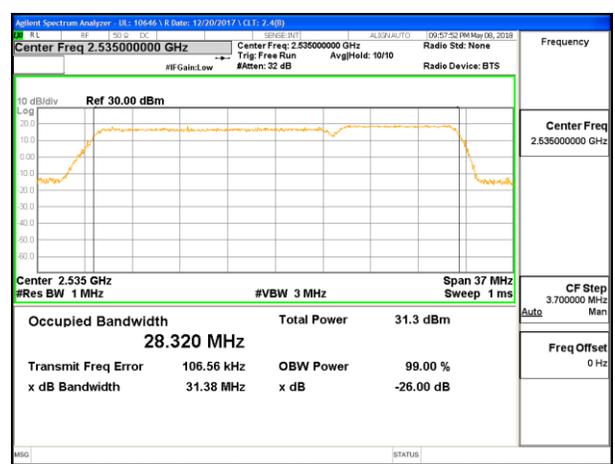
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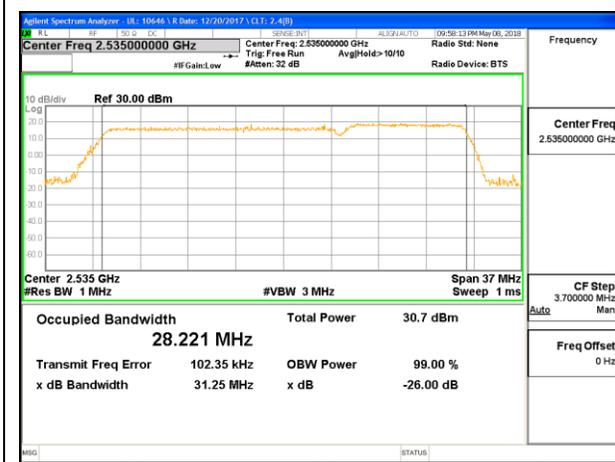
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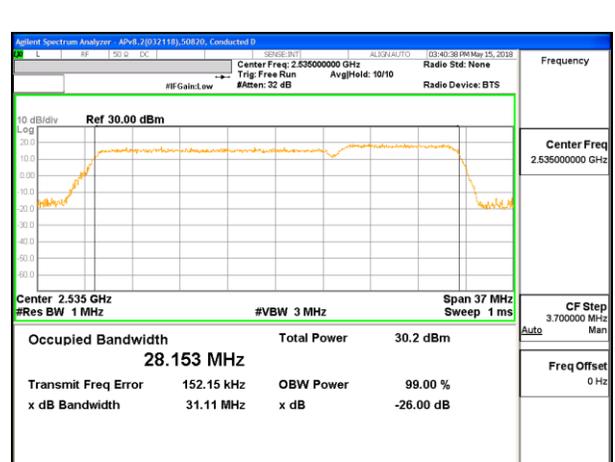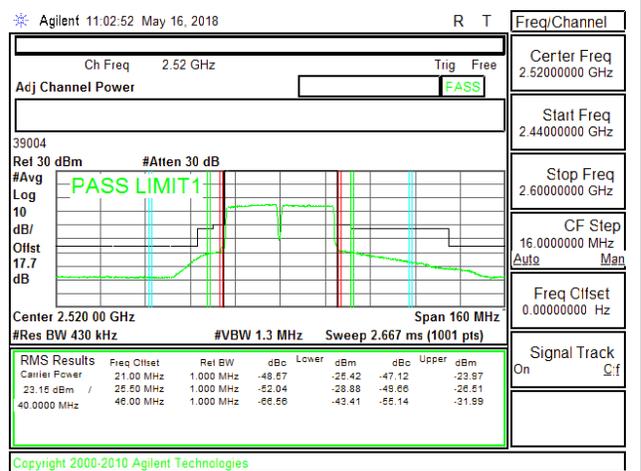

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LTE B7 15MHz + 15MHz QPSK RB75-0 + RB75-0
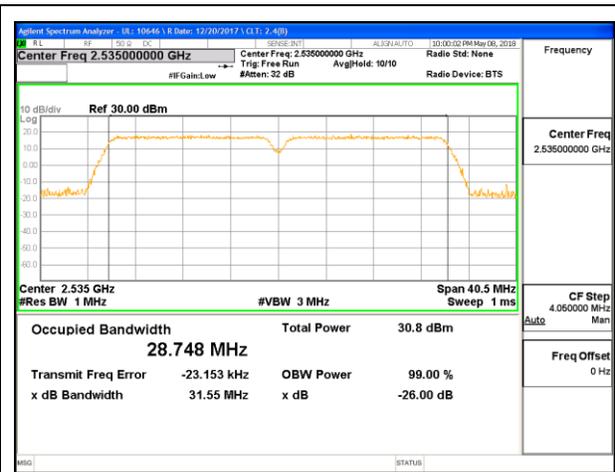
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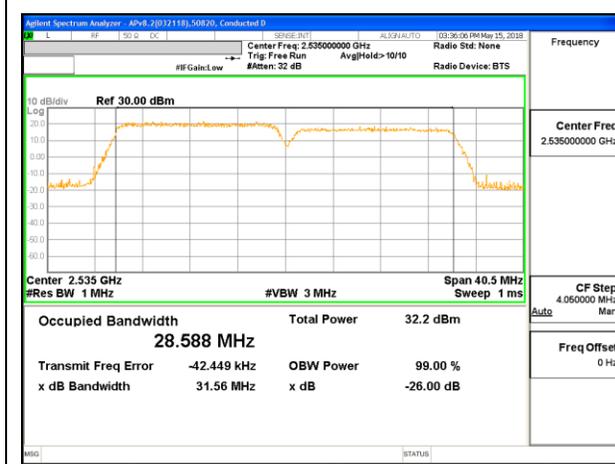
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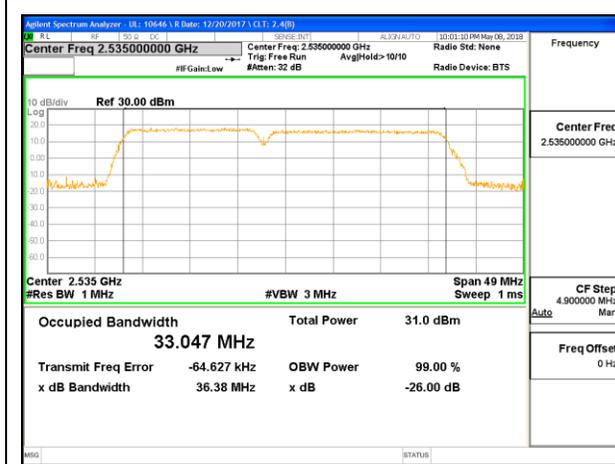
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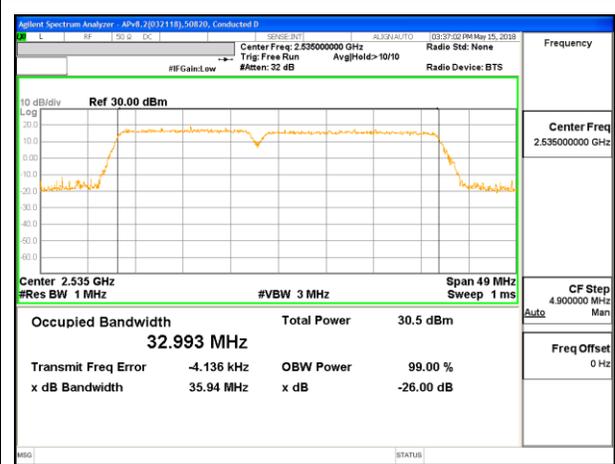
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LTE B7 20MHz + 15MHz QPSK RB100-0 + RB75-0

LTE B7 20MHz + 15MHz 16QAM RB100-0 + RB75-0
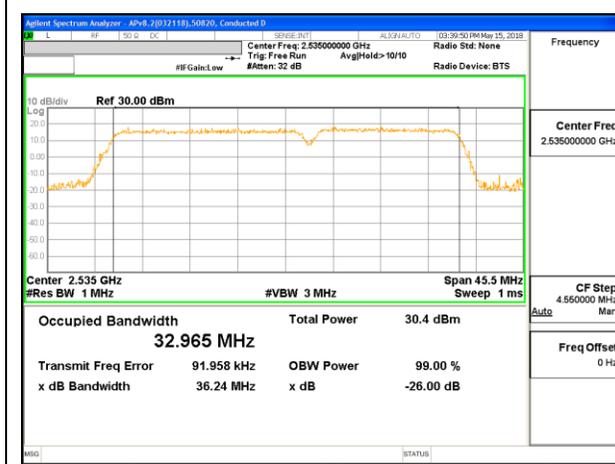
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LTE B7 20MHz + 20MHz QPSK RB100-0 + RB100-0
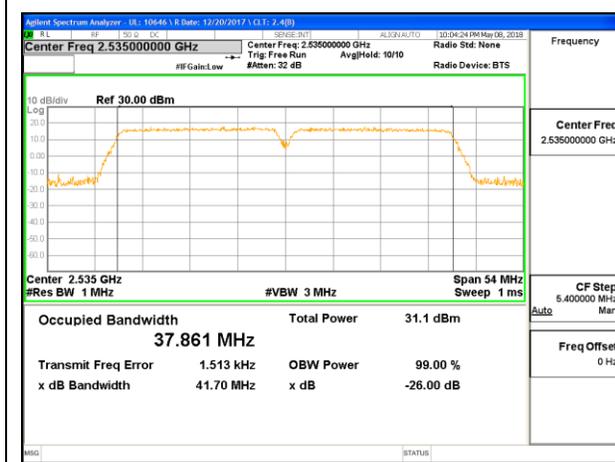
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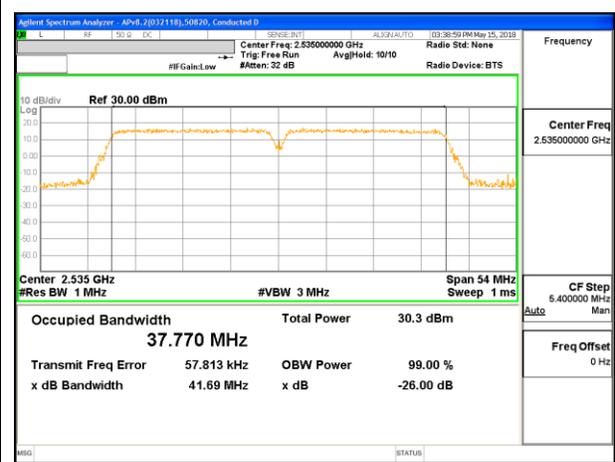
LTE B7 20MHz + 20MHz 64QAM RB100-0 + RB100-0

8.1.2. LTE BAND 41
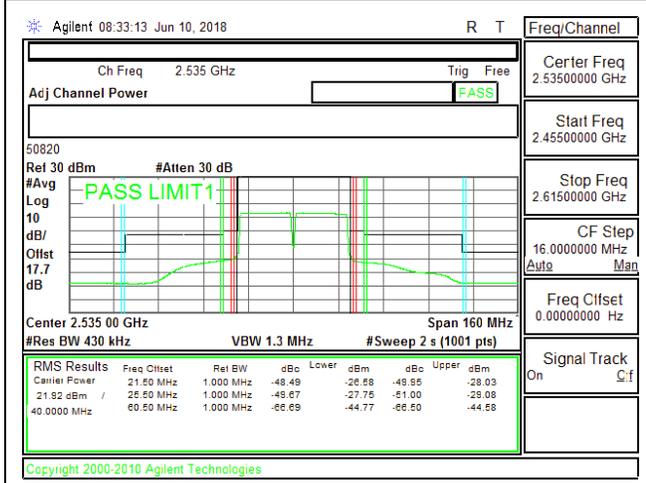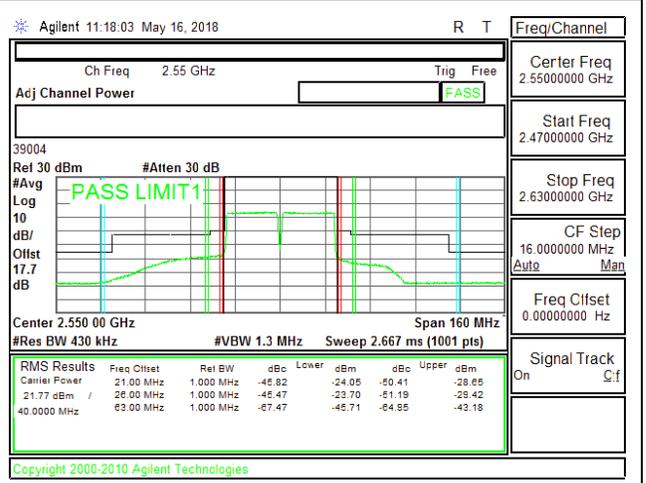

LTE B41 5MHz + 20MHz QPSK RB25-0 + RB100-0
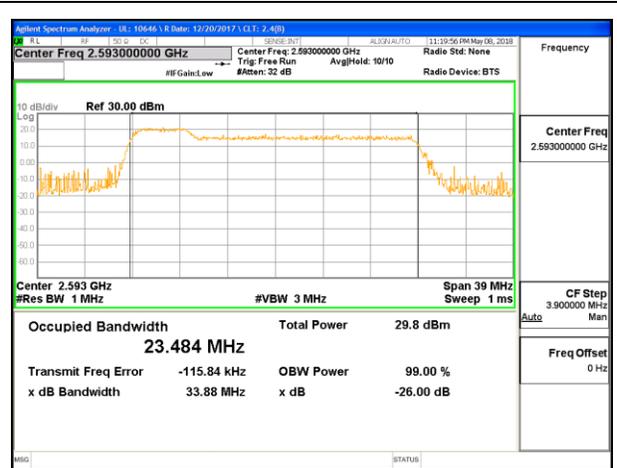
LTE B41 5MHz + 20MHz 16QAM RB25-0 + RB100-0

LTE B41 5MHz + 20MHz 64QAM RB25-0 + RB100-0
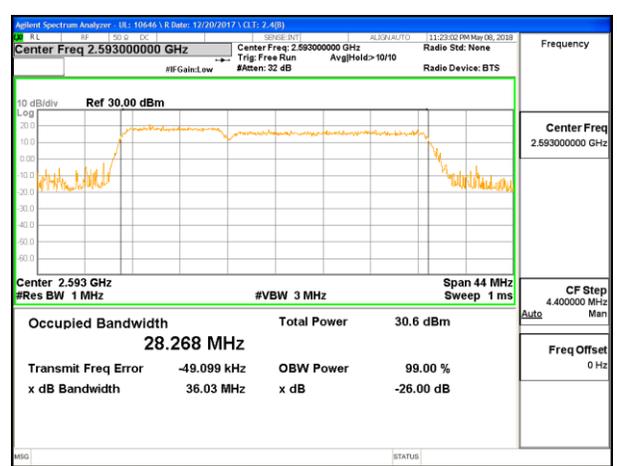
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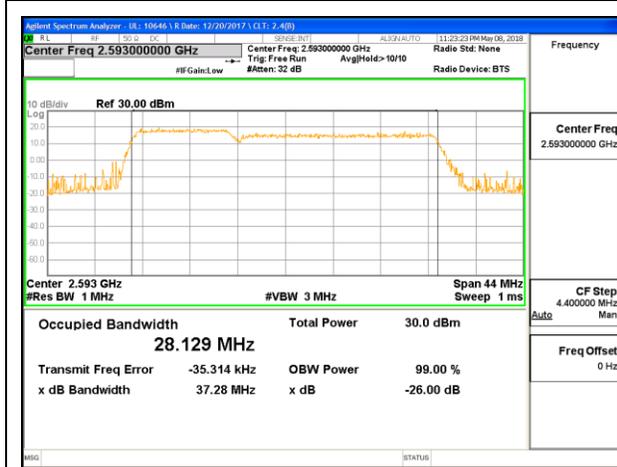
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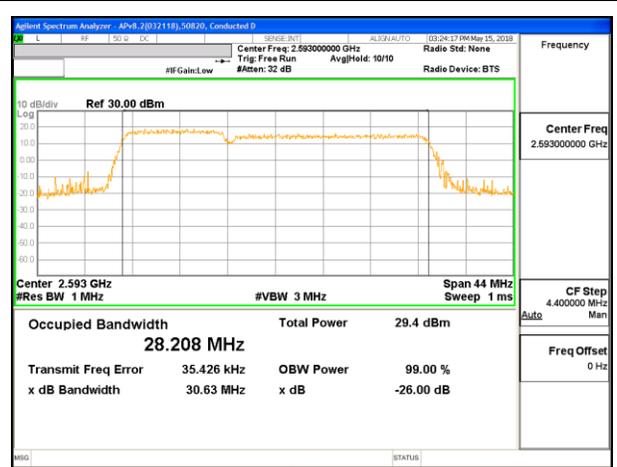
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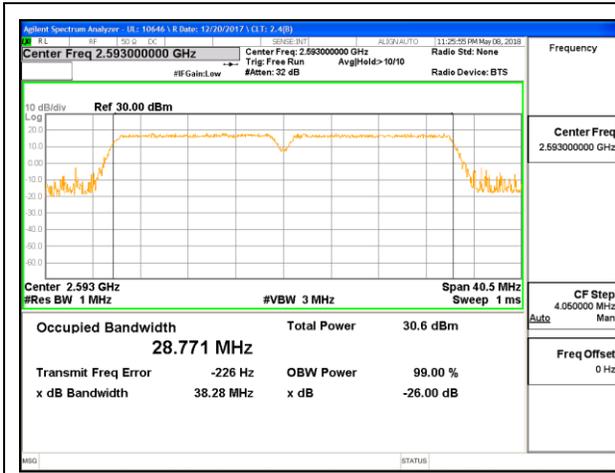
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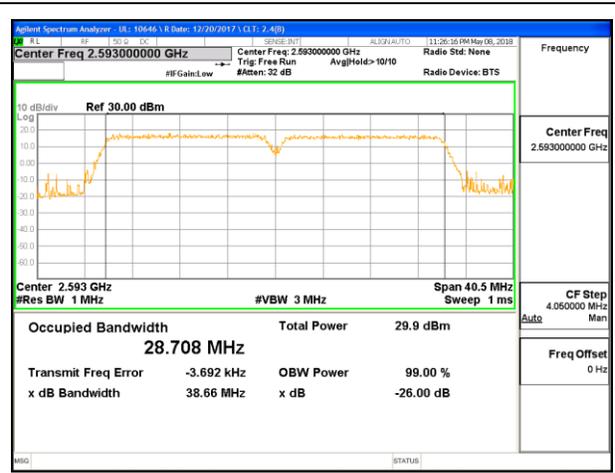
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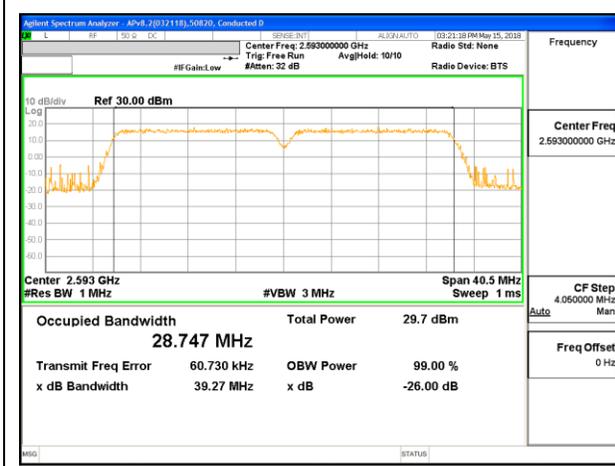
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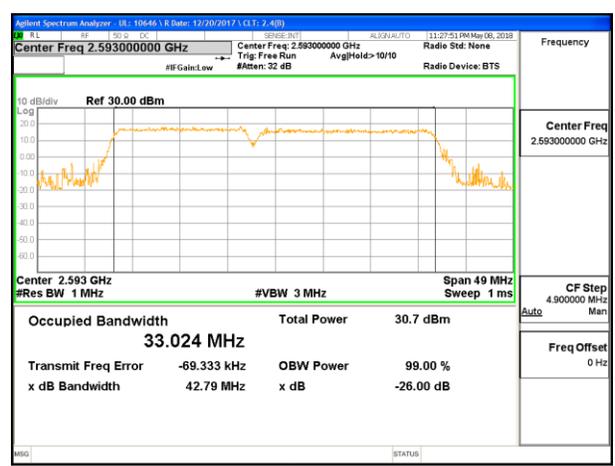
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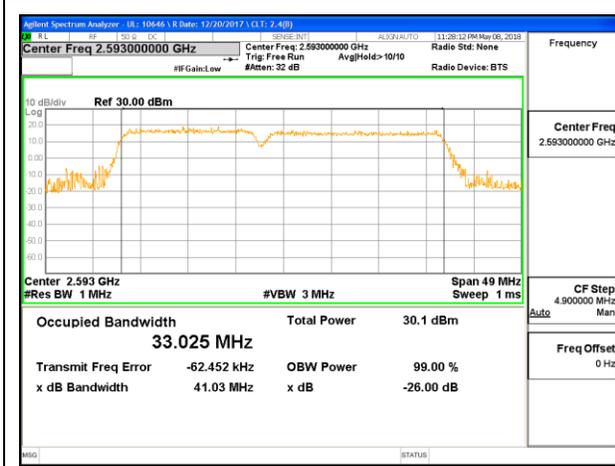
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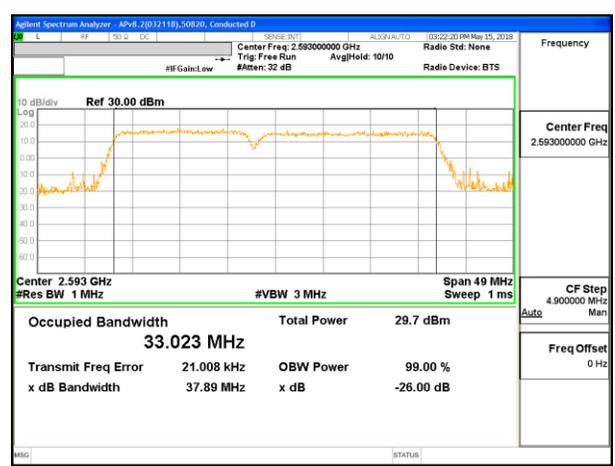
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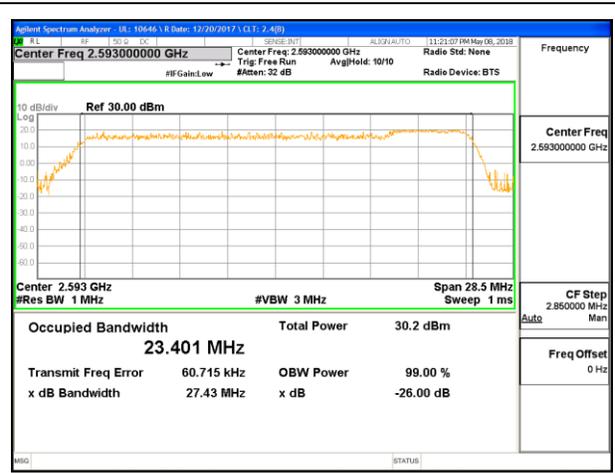
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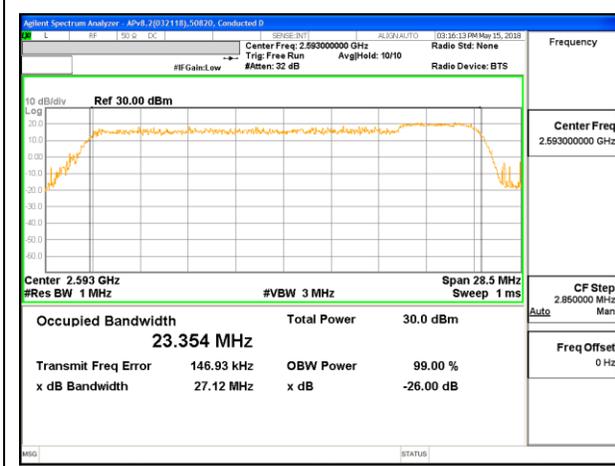
LTE B41 20MHz + 5MHz 64QAM RB100-0 + RB25-0

LTE B41 20MHz + 10MHz QPSK RB100-0 + RB50-0
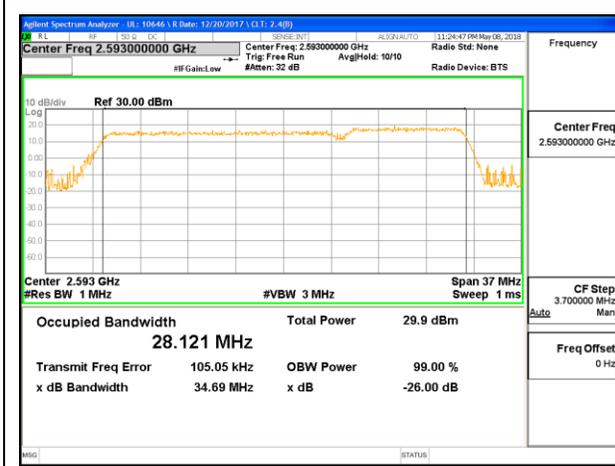
LTE B41 20MHz + 10MHz 16QAM RB100-0 + RB50-0
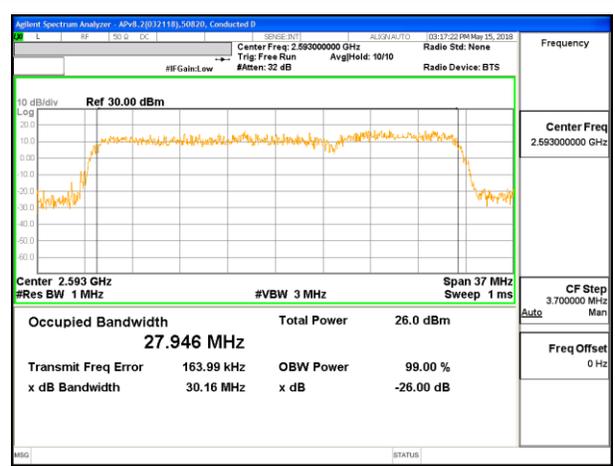
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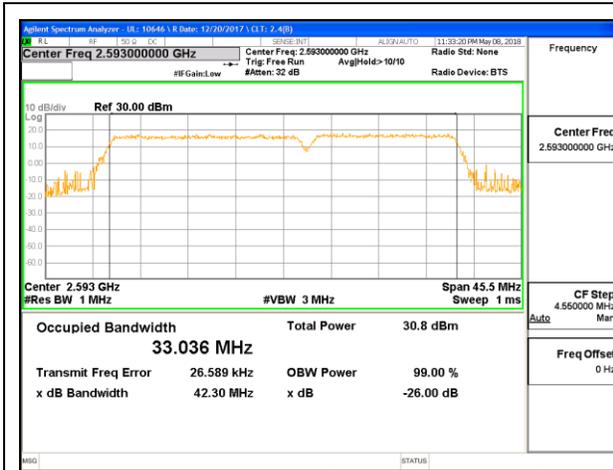
LTE B41 20MHz + 15MHz QPSK RB100-0 + RB75-0

LTE B41 20MHz + 15MHz 16QAM RB100-0 + RB75-0
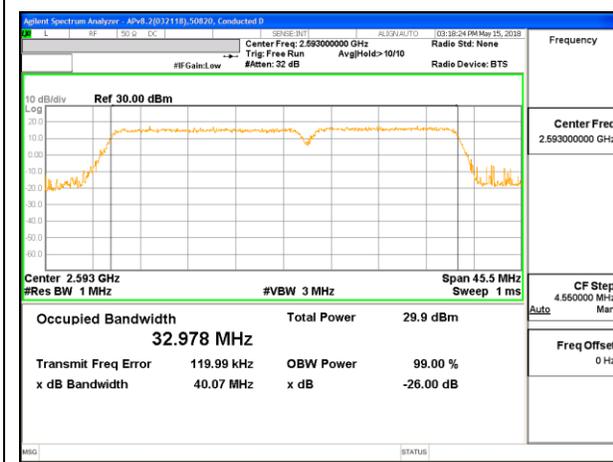
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LTE B41 20MHz + 20MHz QPSK RB100-0 + RB100-0
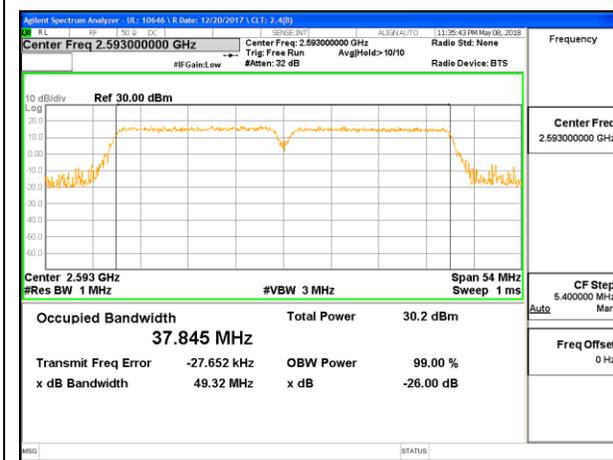
LTE B41 20MHz + 20MHz 16QAM RB100-0 + RB100-0
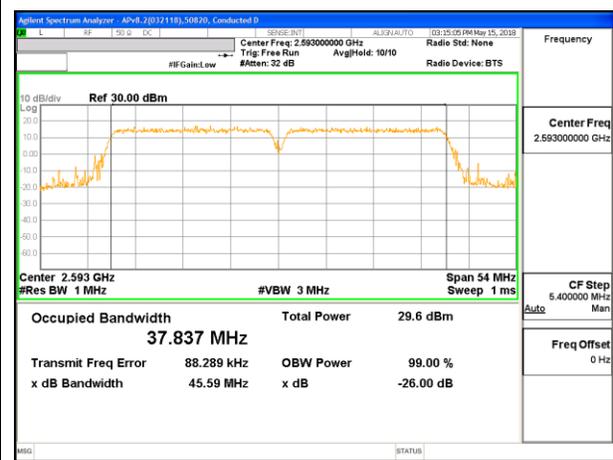
LTE B41 20MHz + 20MHz 64QAM RB100-0 + RB100-0

8.2. EMISSION MASK

RULE PART(S)

FCC: §2.1051, §27.53

LIMITS

FCC: §27.53(m)(4) For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

TEST PROCEDURE FOR FCC PART 27

(m)(6) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed; for mobile digital stations, in the 1 megahertz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 megahertz band is 2495-2496 MHz, in which case a resolution bandwidth of at least one percent may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 megahertz or 1 percent of emission bandwidth, as specified; or 1 megahertz or 2 percent for mobile digital stations, except in the band 2495-2496 MHz). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

MODES TESTED

- LTE Band 7
- LTE Band 41

RESULTS

8.2.1. LTE BAND 7
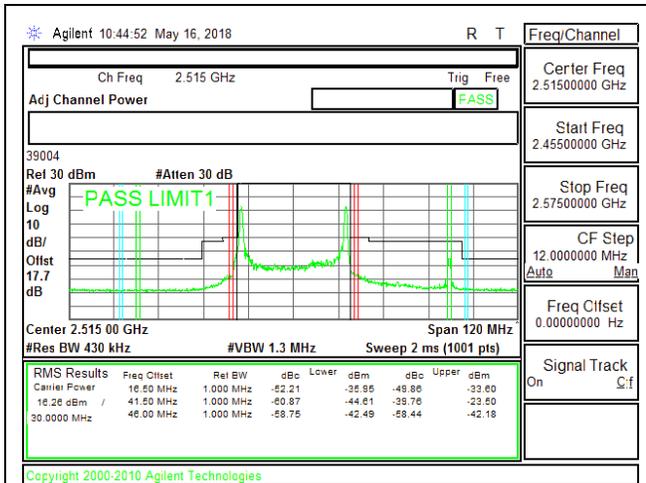
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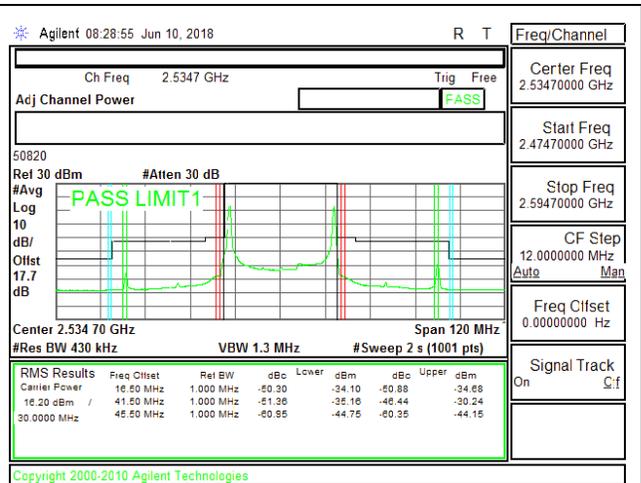
LTE B7 20MHz + 10MHz QPSK Mid Ch RB1-0 + RB1-49
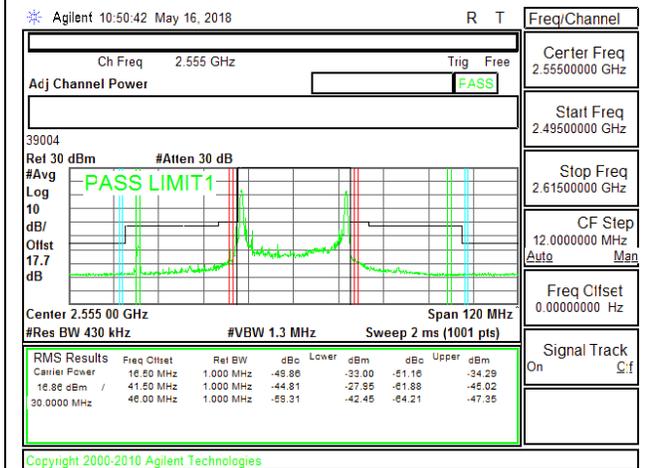
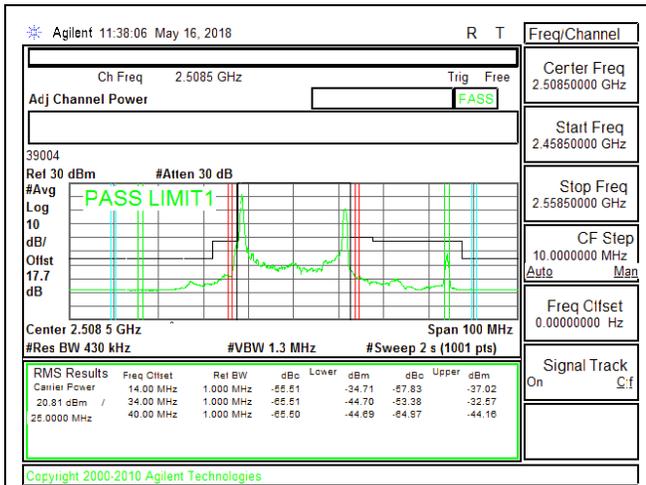LTE B7 20MHz + 10MHz QPSK High Ch RB1-0 + RB1-49
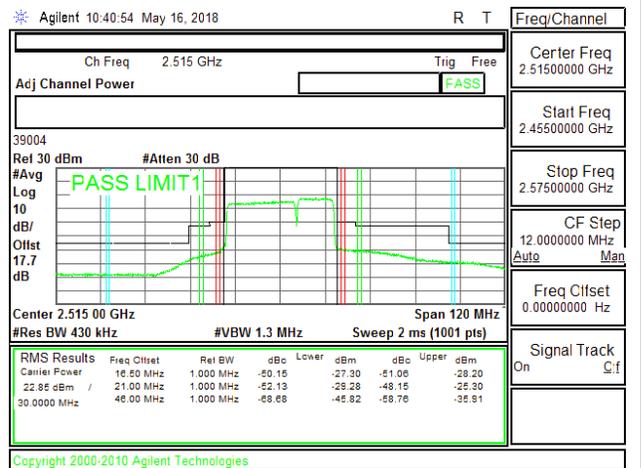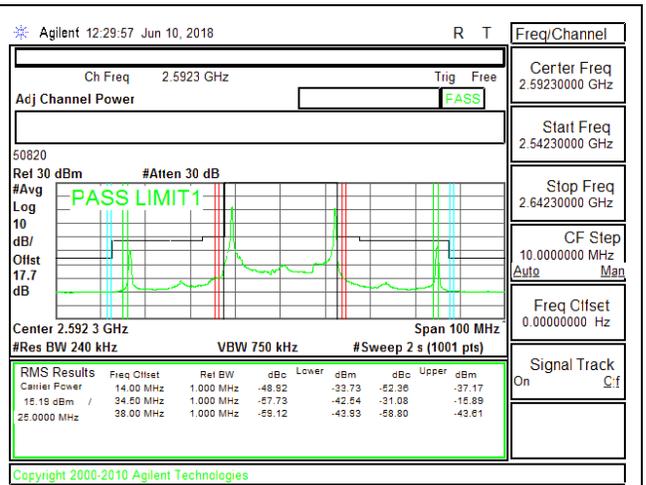

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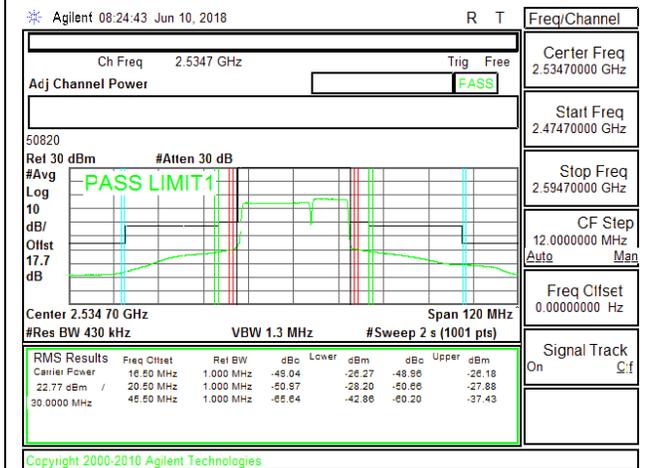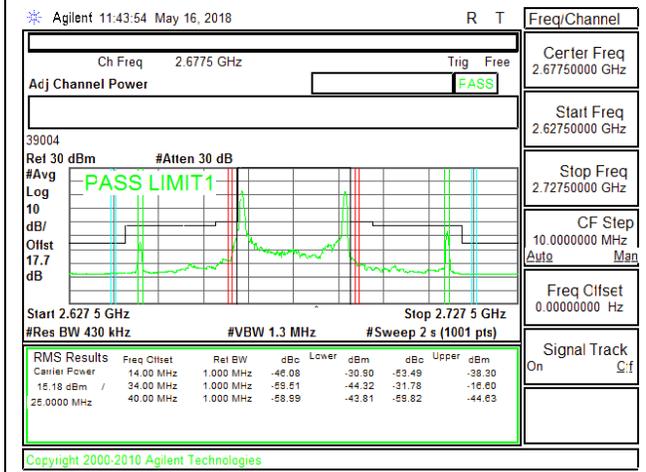

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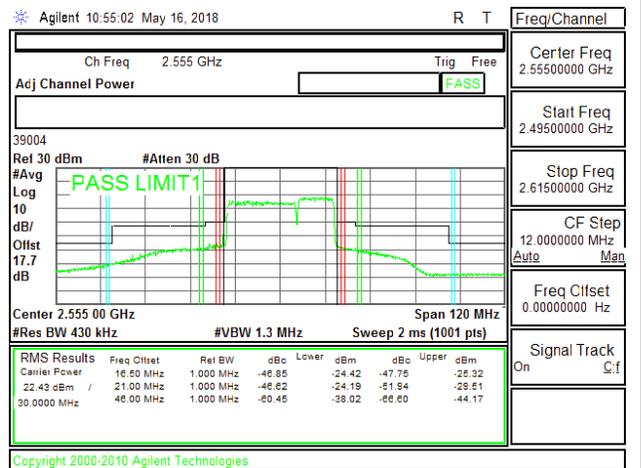
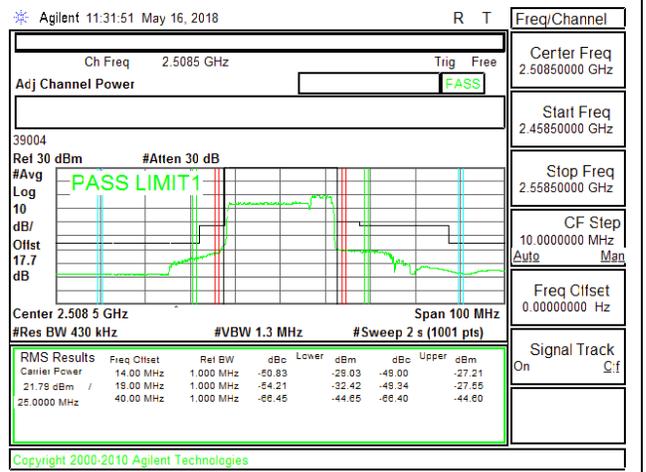LTE B7 20MHz + 10MHz QPSK High Ch RB100-0 + RB50-0
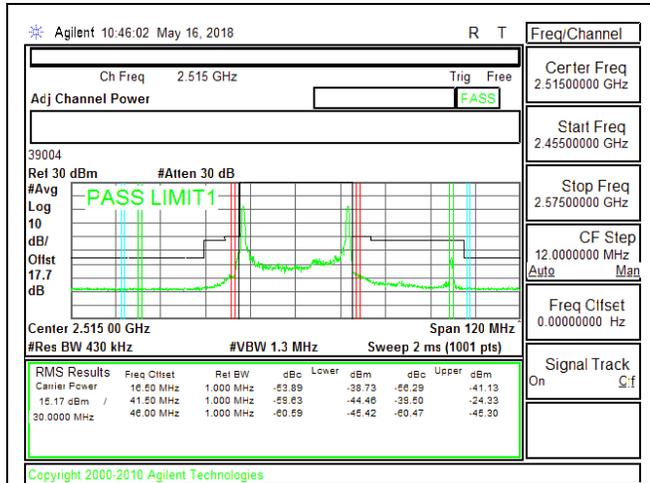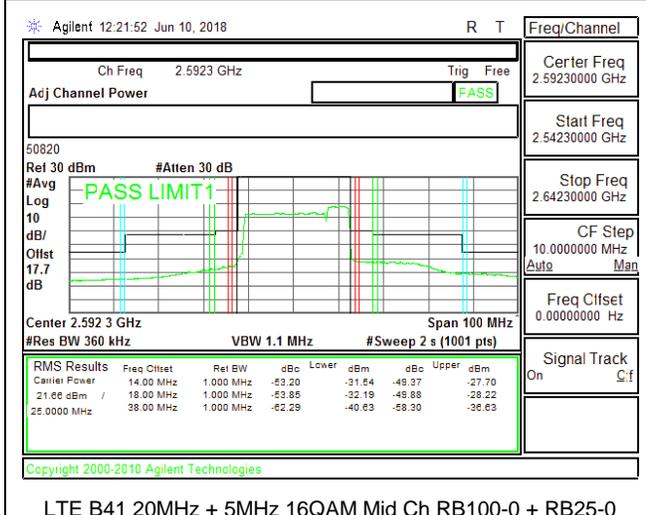
LTE B7 20MHz + 10MHz 16QAM Low Ch RB1-0 + RB1-49
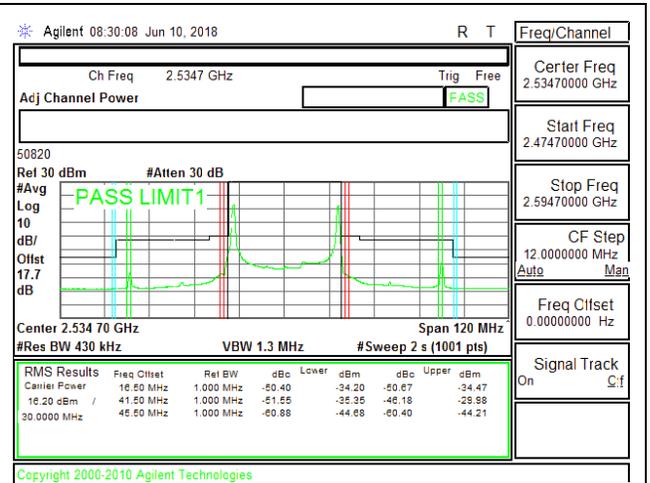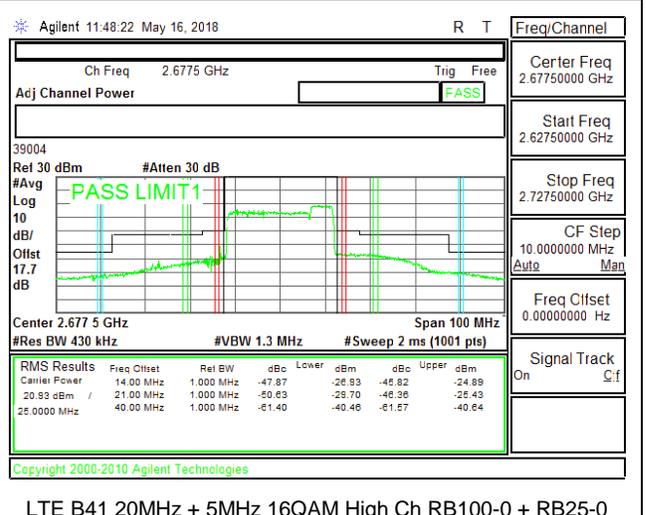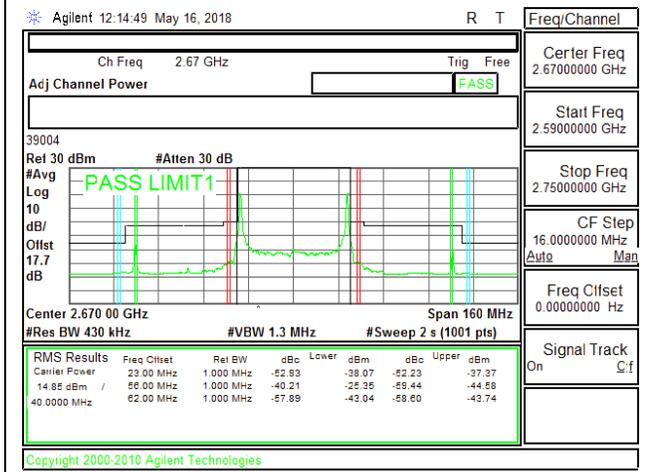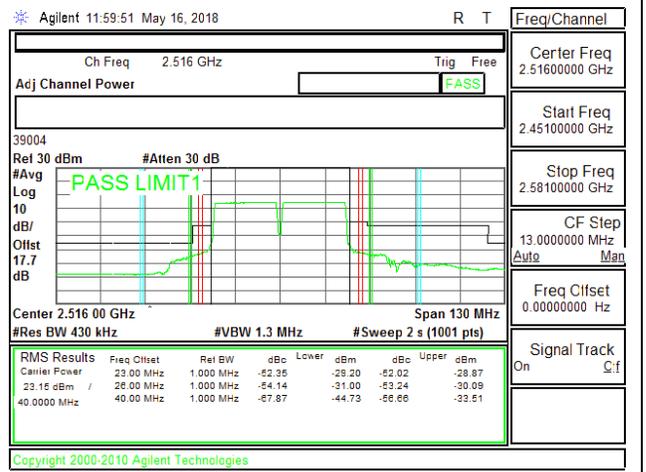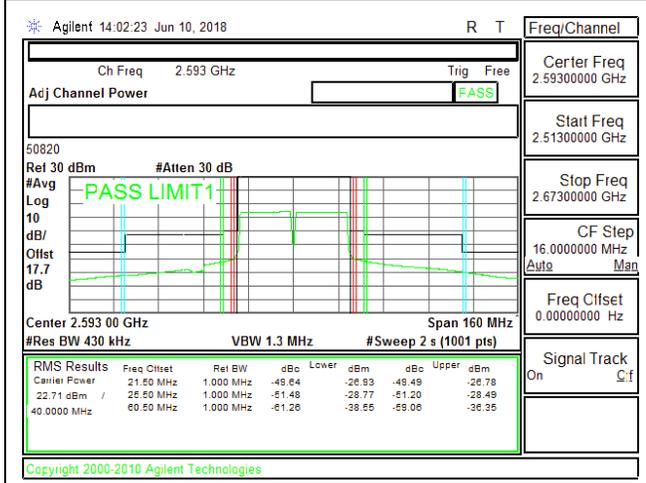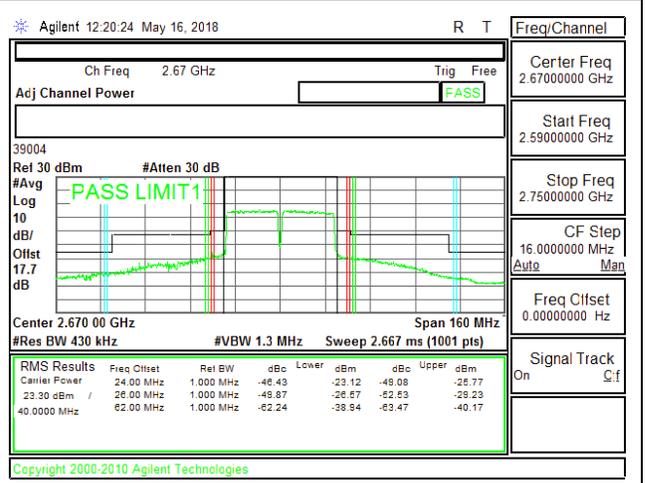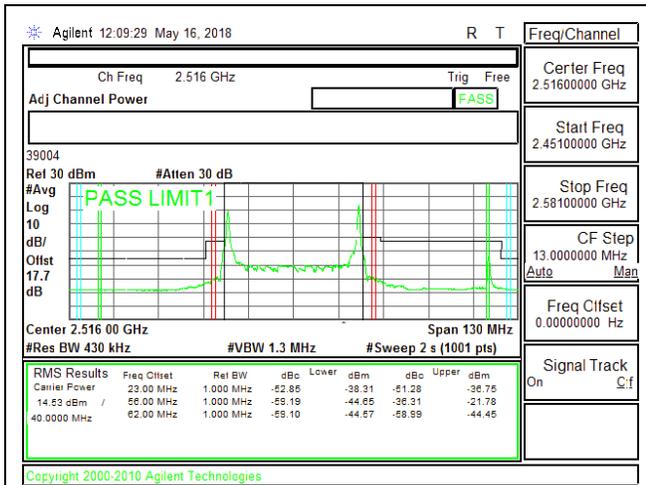

LTE B7 20MHz + 10MHz 16QAM Mid Ch RB1-0 + RB1-49
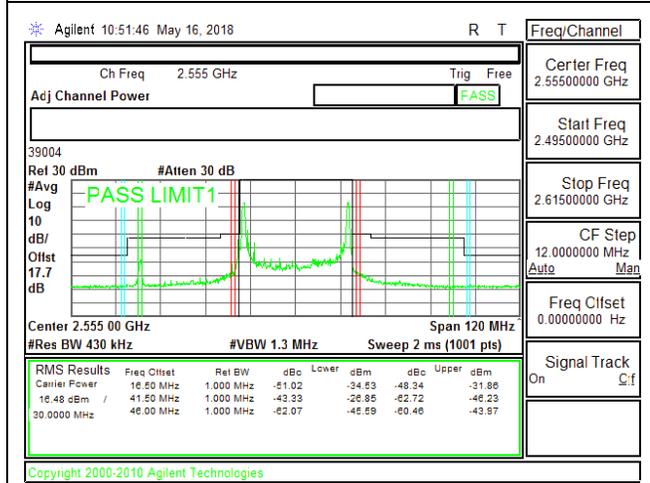
LTE B7 20MHz + 10MHz 16QAM High Ch RB1-0 + RB1-49
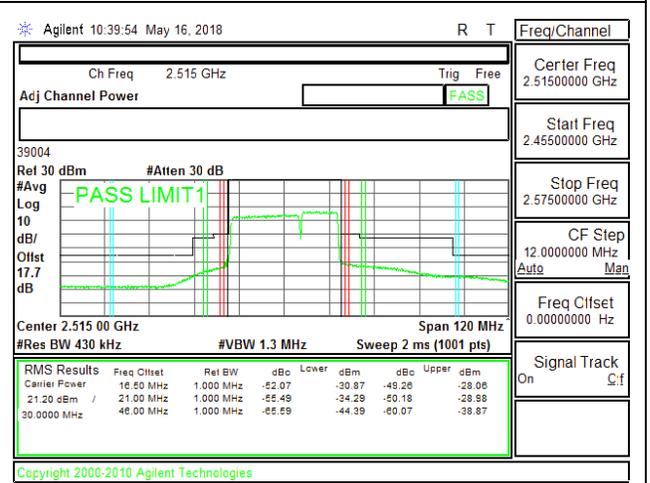
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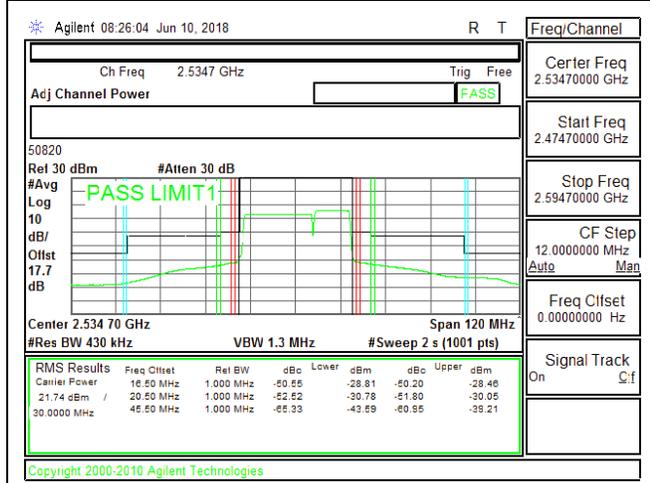
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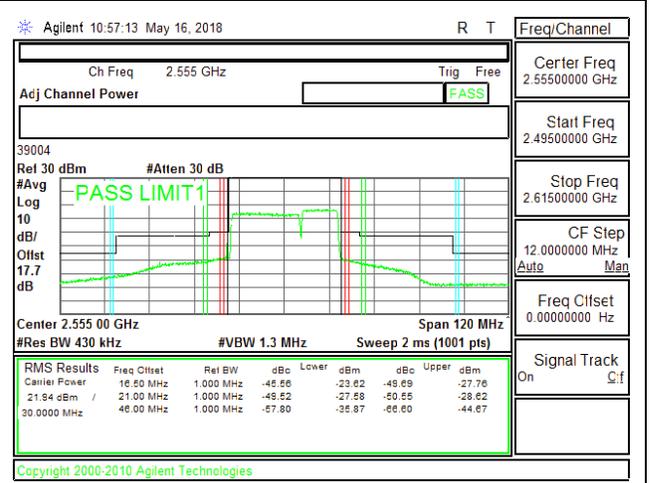
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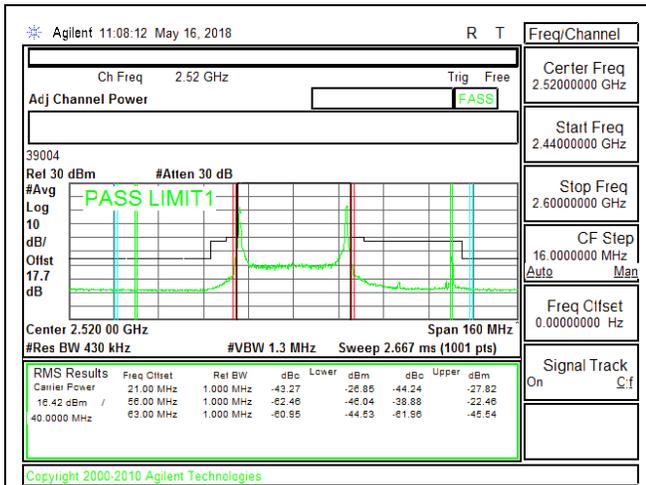
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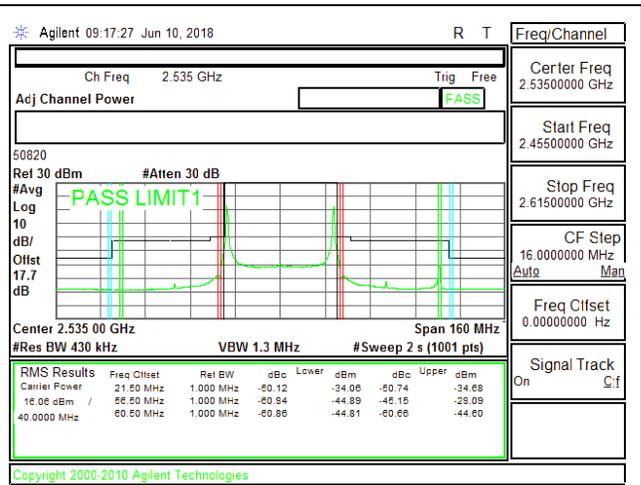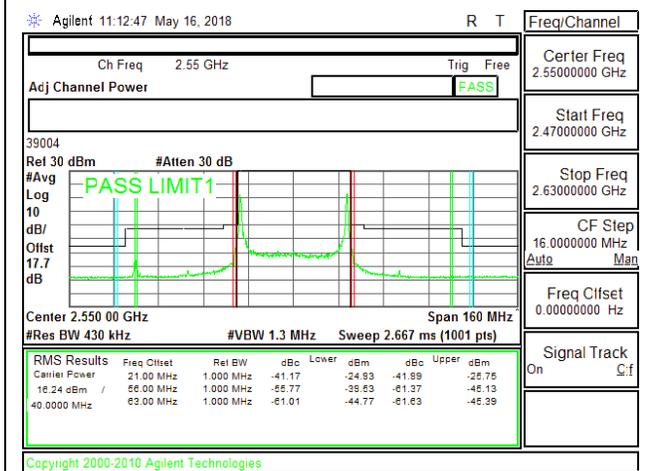
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LTE B7 20MHz + 20MHz QPSK High Ch RB1-0 + RB1-99
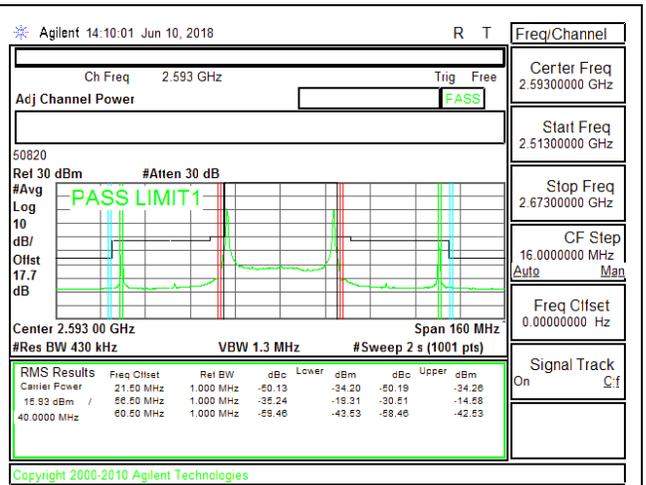

LTE B7 20MHz + 20MHz QPSK Low Ch RB100-0 + RB100-0
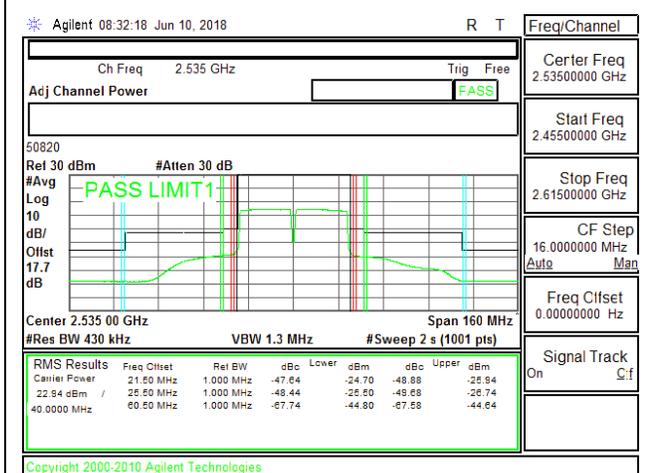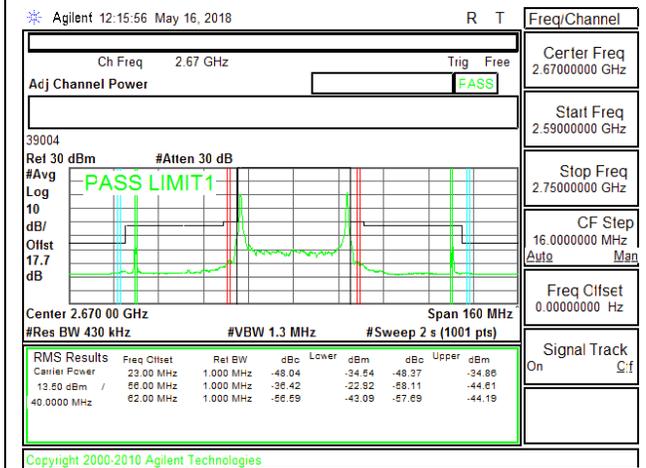

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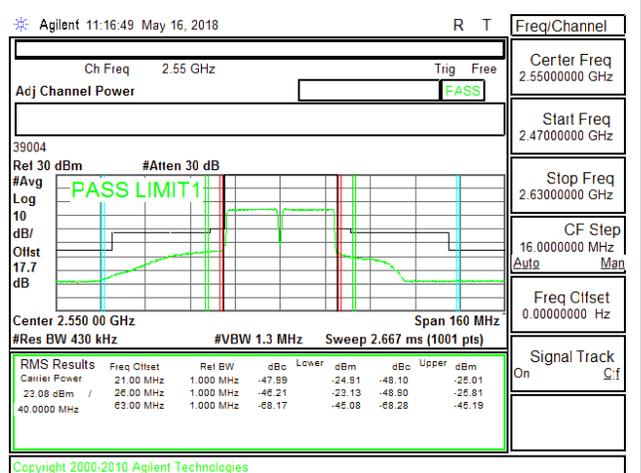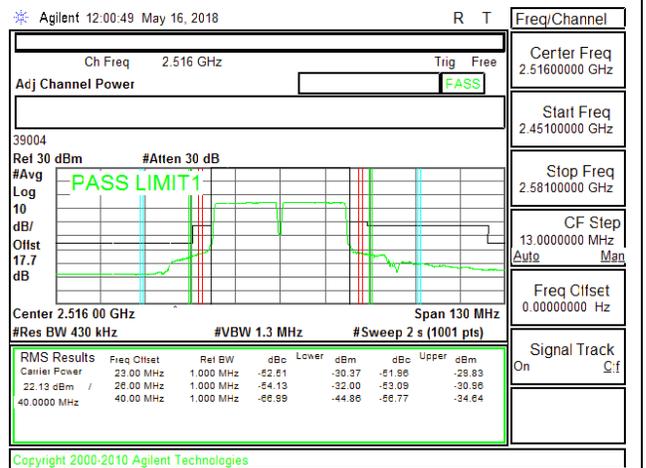

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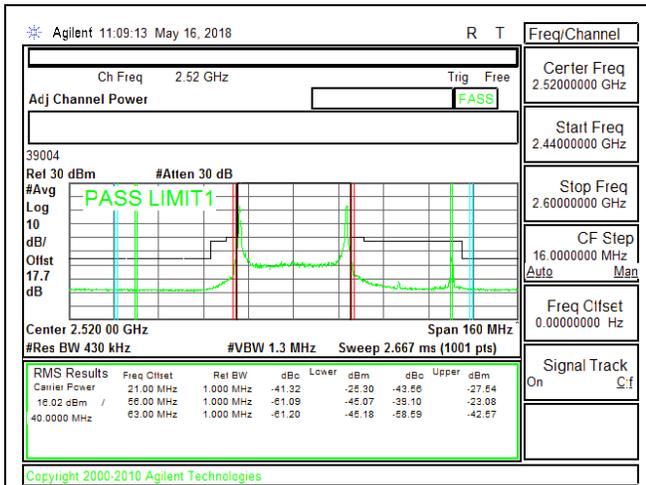
LTE B7 20MHz + 20MHz 16QAM Low Ch RB1-0 + RB1-99
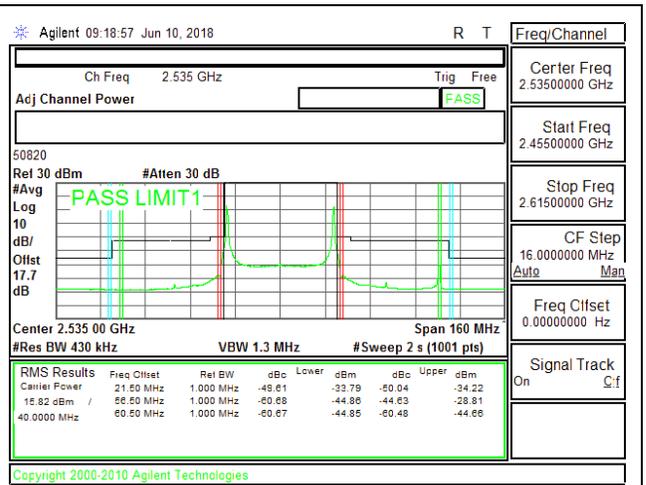
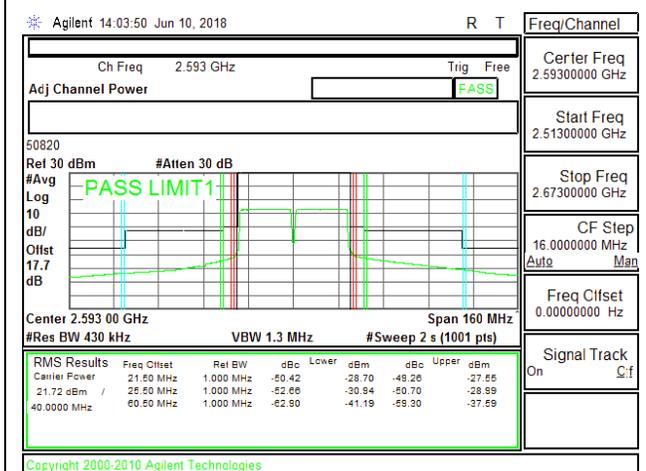
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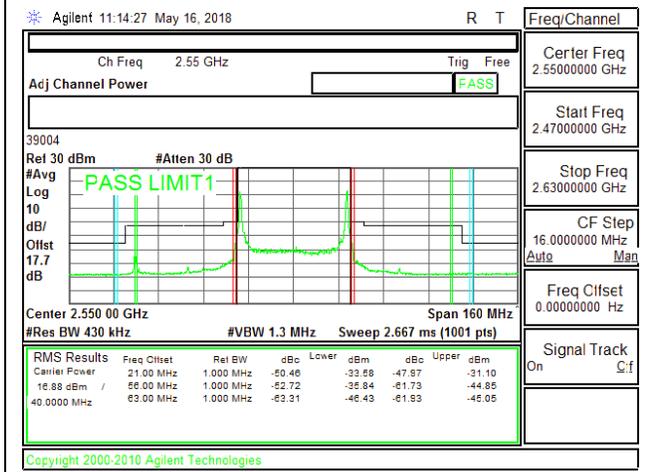
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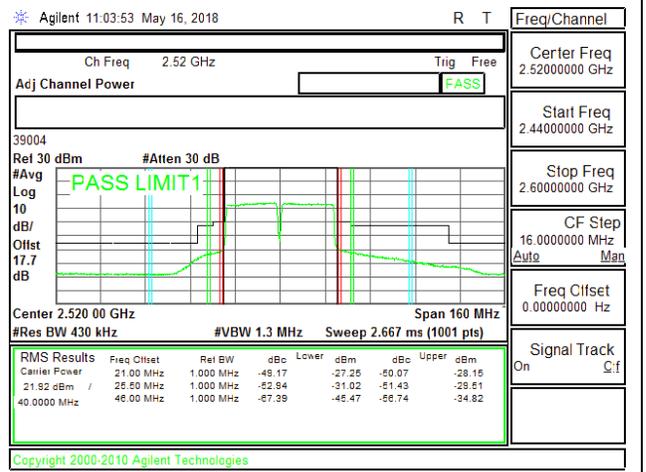
LTE B7 20MHz + 20MHz 16QAM Low Ch RB100-0 + RB100-0

LTE B7 20MHz + 20MHz 16QAM Mid Ch RB100-0 + RB100-0

LTE B7 20MHz + 20MHz 16QAM High Ch RB100-0 + RB100-0

8.2.2. LTE BAND 41
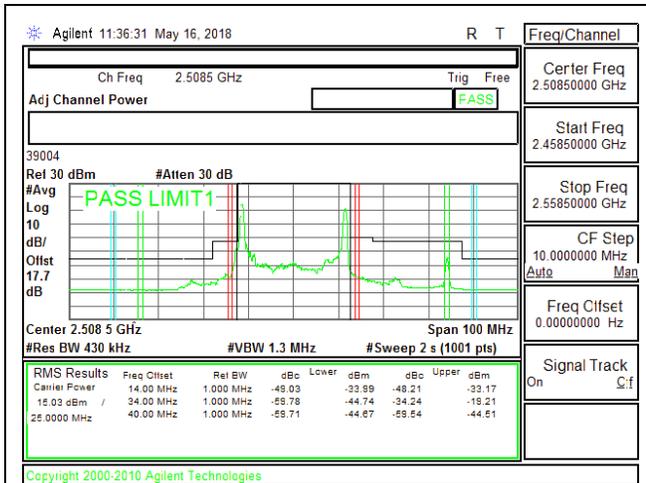
LTE B41 20MHz + 5MHz QPSK Low Ch RB1-0 + RB1-24
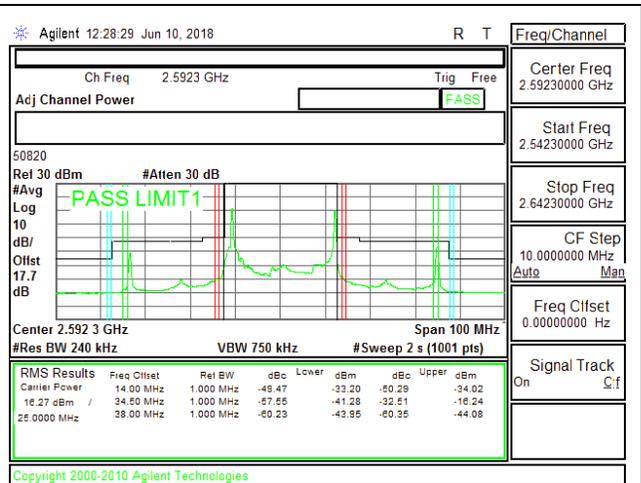
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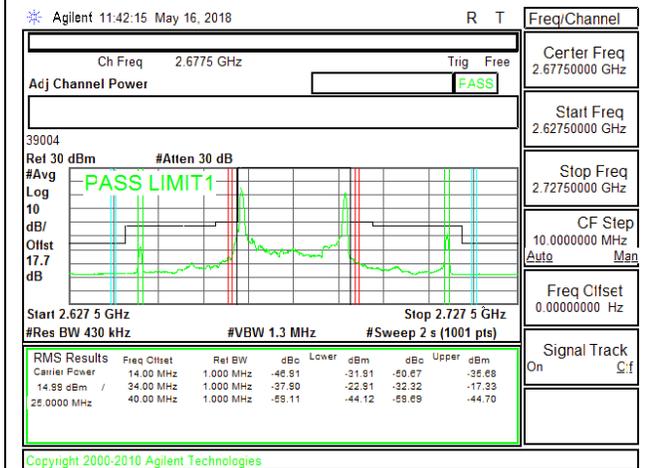
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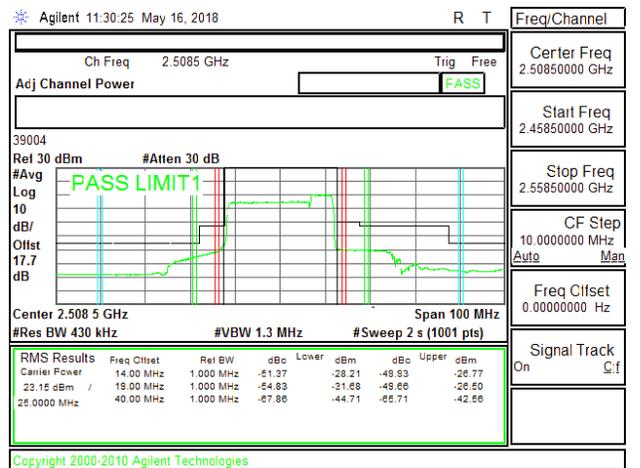
LTE B41 20MHz + 5MHz QPSK Low Ch RB100-0 + RB25-0
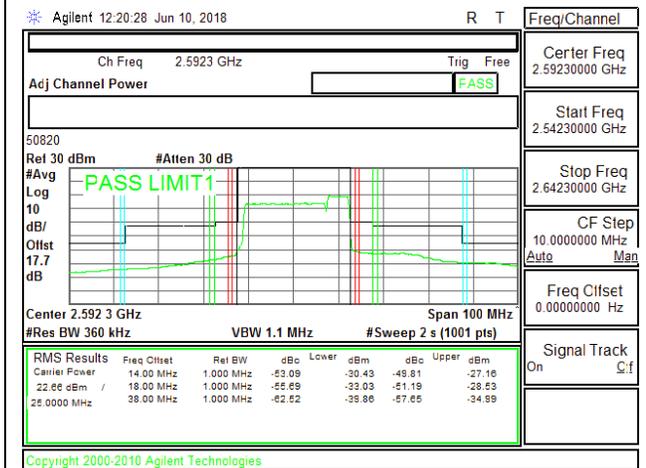
LTE B41 20MHz + 5MHz QPSK Mid Ch RB100-0 + RB25-0

LTE B41 20MHz + 5MHz QPSK High Ch RB100-0 + RB25-0

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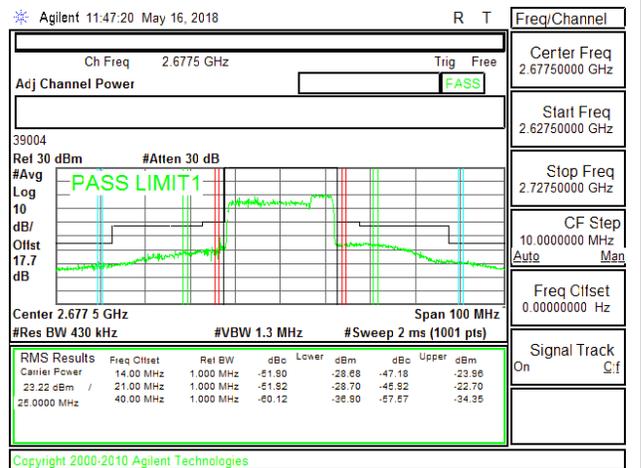
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LTE B41 20MHz + 5MHz 16QAM Mid Ch RB1-0 + RB1-24

LTE B41 20MHz + 5MHz 16QAM High Ch RB1-0 + RB1-24

LTE B41 20MHz + 5MHz 16QAM Low Ch RB100-0 + RB25-0

LTE B41 20MHz + 5MHz 16QAM Mid Ch RB100-0 + RB25-0

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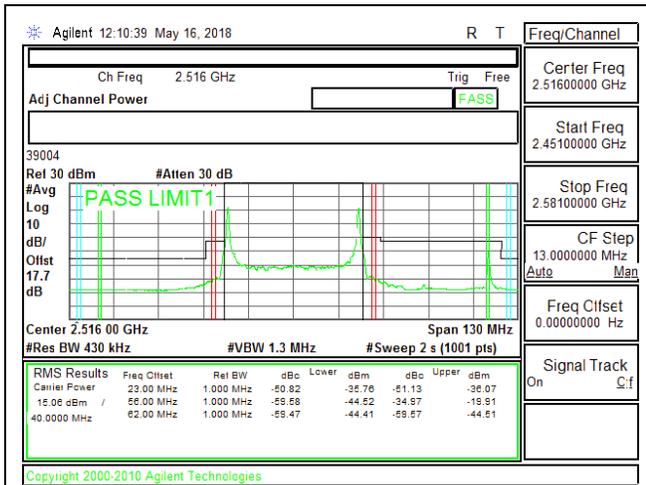
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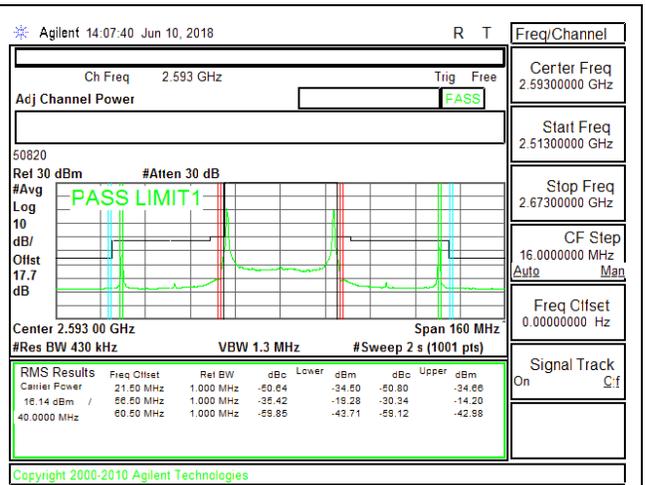
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LTE B41 20MHz + 20MHz QPSK High Ch RB1-0 + RB1-99

LTE B41 20MHz + 20MHz QPSK Low Ch RB100-0 + RB100-0

LTE B41 20MHz + 20MHz QPSK Mid Ch RB100-0 + RB100-0

LTE B41 20MHz + 20MHz QPSK High Ch RB100-0 + RB100-0

LTE B41 20MHz + 20MHz 16QAM Low Ch RB1-0 + RB1-99

LTE B41 20MHz + 20MHz 16QAM Mid Ch RB1-0 + RB1-99

LTE B41 20MHz + 20MHz 16QAM High Ch RB1-0 + RB1-99

LTE B41 20MHz + 20MHz 16QAM Low Ch RB100-0 + RB100-0

LTE B41 20MHz + 20MHz 16QAM Mid Ch RB100-0 + RB100-0
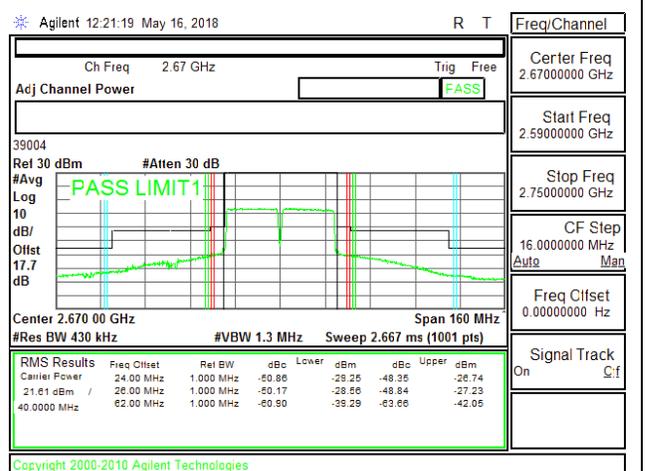
LTE B41 20MHz + 20MHz 16QAM High Ch RB100-0 + RB100-0

8.3. OUT OF BAND EMISSIONS, ANT 1

RULE PART(S)

FCC: §2.1051, §27.53

LIMITS

FCC: §27.53 (m)
The minimum permissible attenuation level of any spurious emissions is 55 + 10 log (P) dB where transmitting power (P) in Watts.

TEST PROCEDURE

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

For each out of band emissions measurement:
- Set display line at -25 dBm
- Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz. (NOTE: Worst case set RBW/VBW to 1MHz/3MHz)

MODES TESTED

- LTE Band 7
- LTE Band 41

8.3.1. LTE BAND 7

LTE B7 20MHz + 10MHz QPSK Low Ch RB1-99 + RB1-0

LTE B7 20MHz + 10MHz 16QAM Low Ch RB1-99 + RB1-0
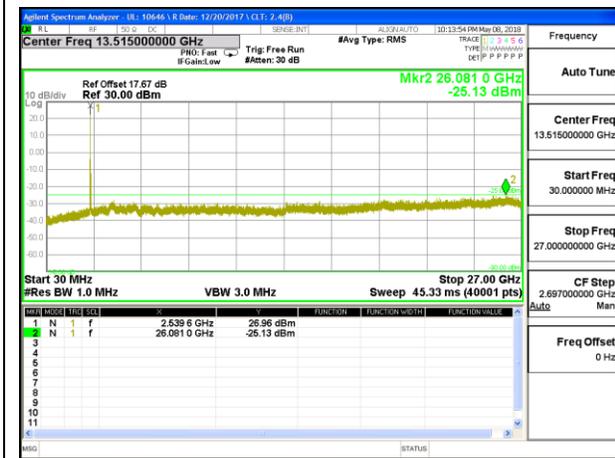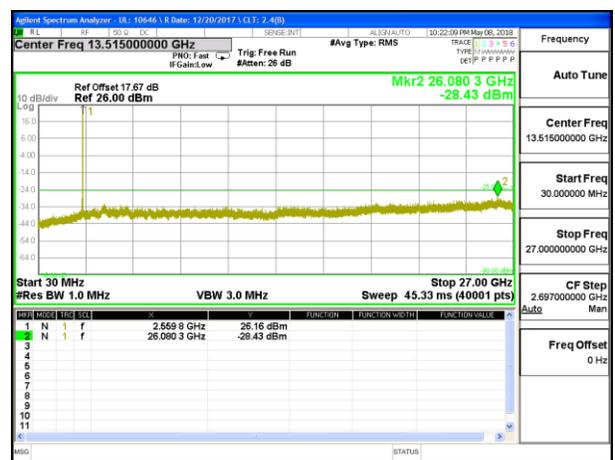

LTE B7 20MHz + 10MHz QPSK Middle Ch RB1-99 + RB1-0
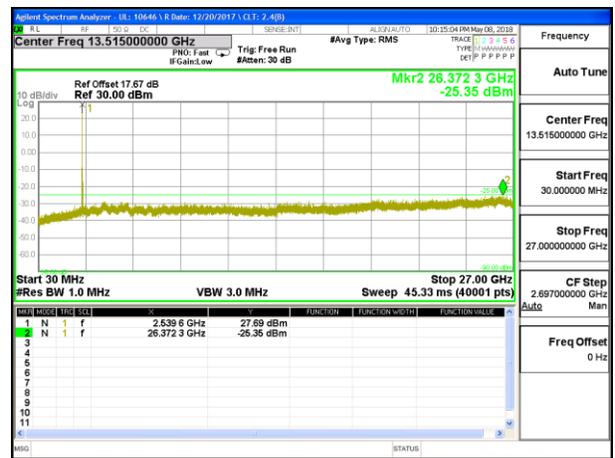
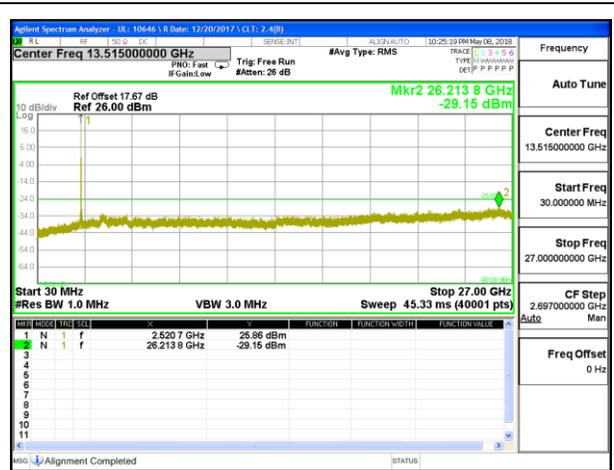LTE B7 20MHz + 10MHz 16QAM Middle Ch RB1-99 + RB1-0-
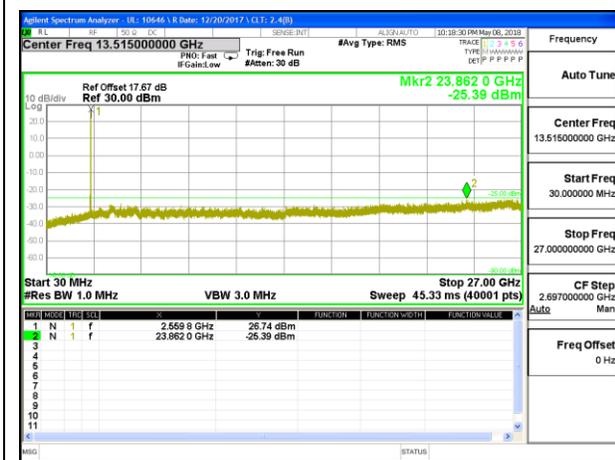
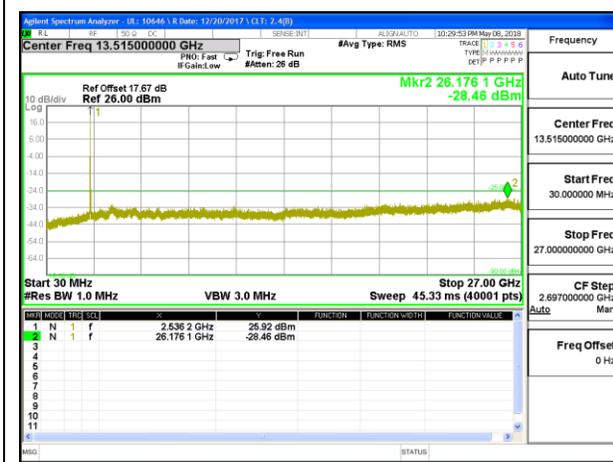LTE B7 20MHz + 10MHz QPSK High Ch RB1-99 + RB1-0

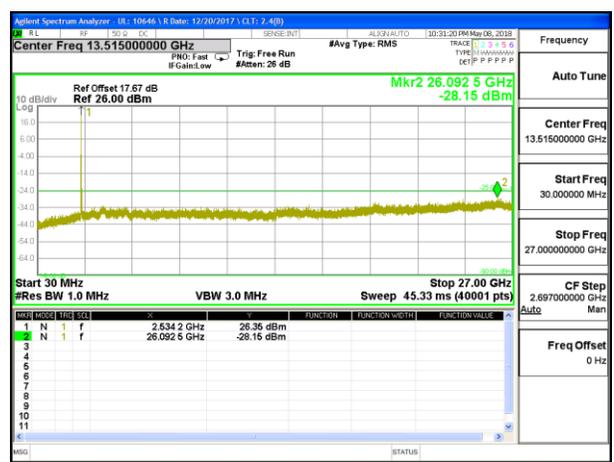LTE B7 20MHz + 10MHz 16QAM High Ch RB1-99 + RB1-0-

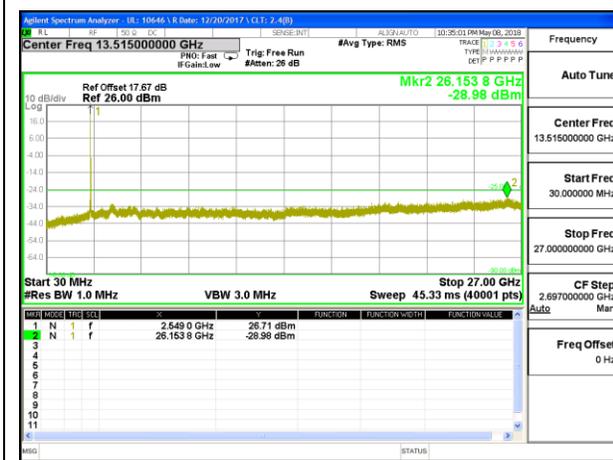LTE B7 20MHz + 20MHz QPSK Low Ch RB1-99 + RB1-0

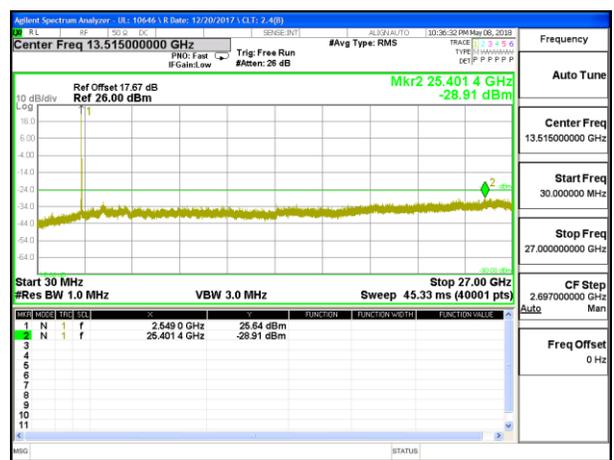LTE B7 20MHz + 20MHz 16QAM Low Ch RB1-99 + RB1-0

LTE B7 20MHz + 20MHz QPSK Middle Ch RB1-99 + RB1-0

LTE B7 20MHz + 20MHz 16QAM Middle Ch RB1-99 + RB1-0-

LTE B7 20MHz + 20MHz QPSK High Ch RB1-99 + RB1-0

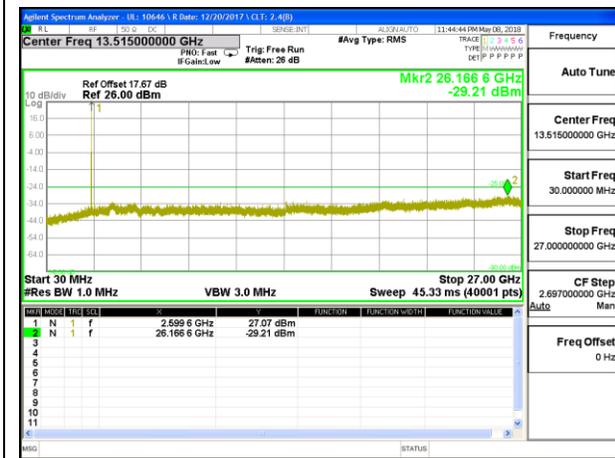LTE B7 20MHz + 20MHz 16QAM High Ch RB1-99 + RB1-0-

8.3.2. LTE BAND 41

LTE B41 20MHz + 5MHz QPSK Low Ch RB1-99 + RB1-0

LTE B41 20MHz + 5MHz 16QAM Low Ch RB1-99 + RB1-0

LTE B41 20MHz + 5MHz QPSK Middle Ch RB1-99 + RB1-0

LTE B41 20MHz + 5MHz 16QAM Middle Ch RB1-99 + RB1-0

LTE B41 20MHz + 5MHz QPSK High Ch RB1-99 + RB1-0

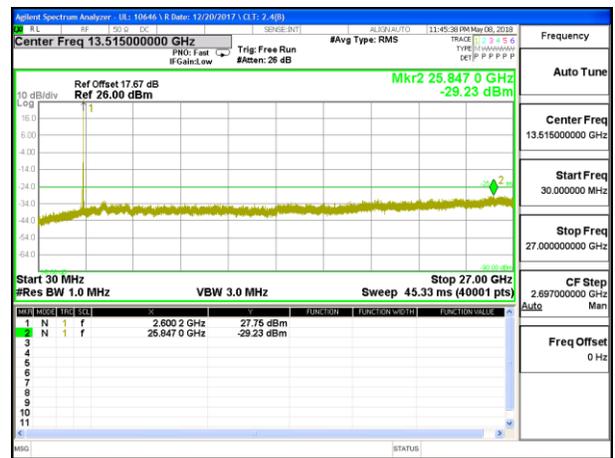LTE B41 20MHz + 5MHz 16QAM High Ch RB1-99 + RB1-0

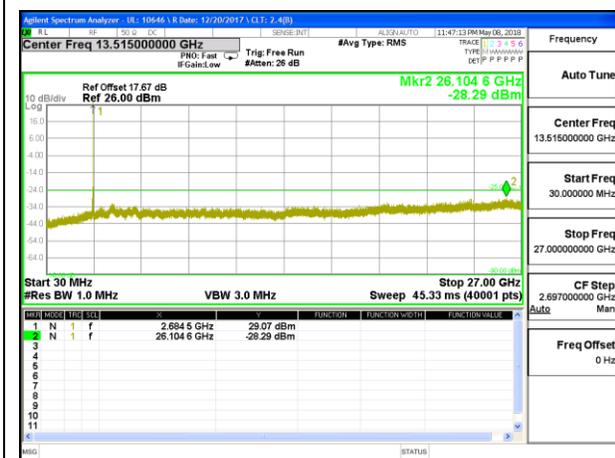LTE B41 20MHz + 20MHz QPSK Low Ch RB1-99 + RB1-0

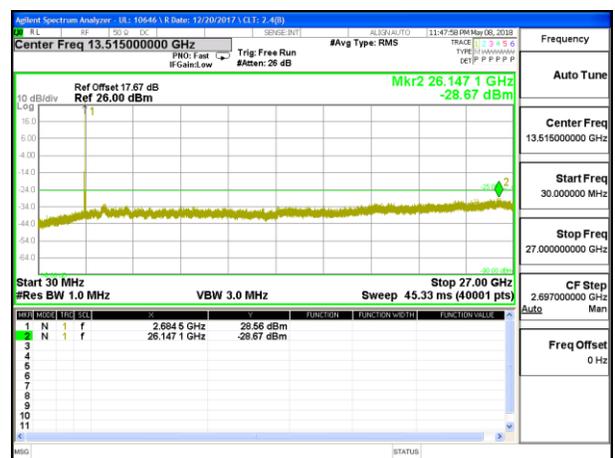LTE B41 20MHz + 20MHz 16QAM Low Ch RB1-99 + RB1-0

LTE B41 20MHz + 20MHz QPSK Middle Ch RB1-99 + RB1-0

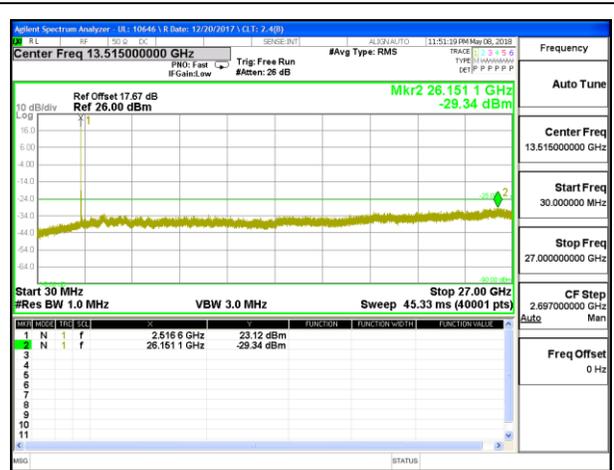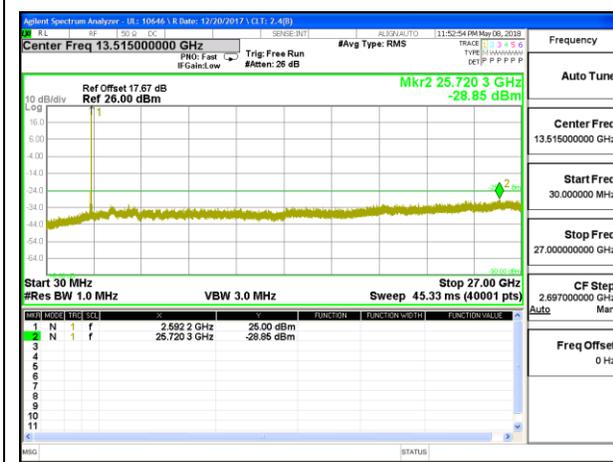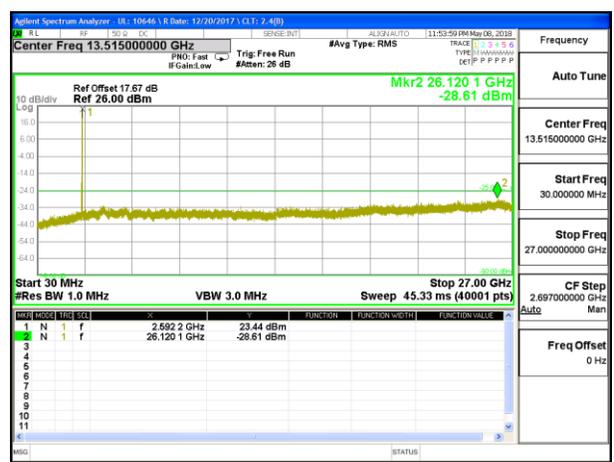LTE B41 20MHz + 20MHz 16QAM Middle Ch RB1-99 + RB1-0-
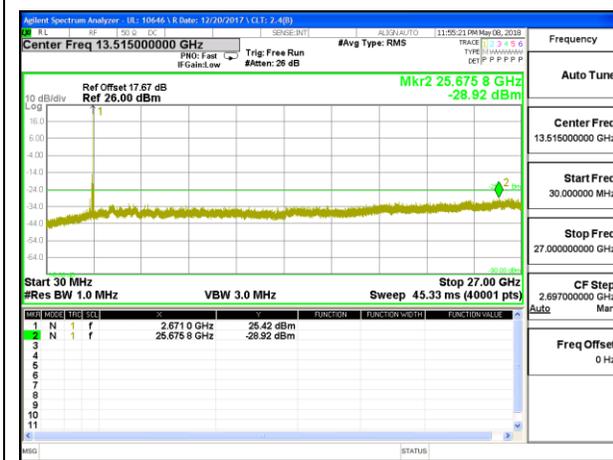
LTE B41 20MHz + 20MHz QPSK High Ch RB1-99 + RB1-0
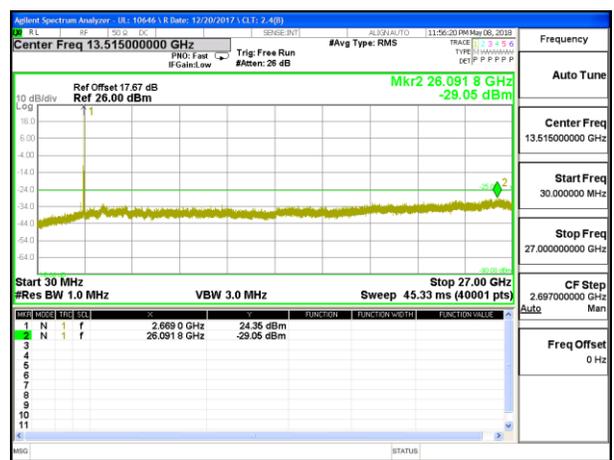
LTE B41 20MHz + 20MHz 16QAM High Ch RB1-99 + RB1-0-

8.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §27.54

LIMITS

FCC: §27.54
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

TEST PROCEDURE

Use CMW 500 with Frequency Error measurement capability.

- Temp. = −30°C to +50°C

- Voltage = (85% - 115%)

    Low voltage, 3.23VDC, Normal, 3.8VDC and High voltage, 4.37VDC.
    End Voltage, 3.2VDC.

Frequency Stability vs Temperature:
The EUT is place inside a temperature chamber. The temperature is set to 20°C and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until +50°C is reached.

Frequency Stability vs Voltage:
The peak frequency error is recorded (worst-case).

MODES TESTED

- LTE Band 7
- LTE Band 41

RESULTS

See the following pages.

8.4.1. LTE BAND 7

ID:	44366	Date:	3/28/18

QPSK, (20MHz + 10MHz BANDWIDTH)

Limit		2500	2570		
Condition		F low @ -13dBm	F high @ -13dBm	Delta (Hz)	Frequency Stability (ppm)
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	2501.1046	2568.9040		
Extreme (50C)		2501.1046	2568.9040	-125.0	-0.049
Extreme (40C)		2501.1046	2568.9040	44.1	0.017
Extreme (30C)		2501.1046	2568.9040	43.5	0.017
Extreme (10C)		2501.1046	2568.9040	35.8	0.014
Extreme (0C)		2501.1046	2568.9040	39.0	0.015
Extreme (-10C)		2501.1046	2568.9040	-28.4	-0.011
Extreme (-20C)		2501.1046	2568.9040	-41.1	-0.016
Extreme (-30C)		2501.1046	2568.9040	-89.6	-0.035
20C	15%	2501.1046	2568.9040	48.0	0.019
	-15%	2501.1046	2568.9040	43.0	0.017
	End Point	2501.1046	2568.9040	-37.0	-0.015

QPSK, (20MHz + 20MHz BANDWIDTH)

Limit		2500	2570		
Condition		F low @ -13dBm	F high @ -13dBm	Delta (Hz)	Frequency Stability (ppm)
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	2501.1250	2568.8548		
Extreme (50C)		2501.1250	2568.8548	79.7	0.031
Extreme (40C)		2501.1250	2568.8548	75.9	0.030
Extreme (30C)		2501.1250	2568.8548	66.0	0.026
Extreme (10C)		2501.1250	2568.8548	65.5	0.026
Extreme (0C)		2501.1250	2568.8548	-68.0	-0.027
Extreme (-10C)		2501.1250	2568.8548	-89.3	-0.035
Extreme (-20C)		2501.1250	2568.8548	-18.3	-0.007
Extreme (-30C)		2501.1250	2568.8548	27.7	0.011
20C	15%	2501.1250	2568.8548	52.0	0.021
	-15%	2501.1250	2568.8548	48.0	0.019
	End Point	2501.1250	2568.8548	-43.0	-0.017

8.4.2. LTE BAND 41

ID:	44366	Date:	3/28/18

QPSK, (20MHz + 5MHz BANDWIDTH)

Limit		2496	2690	Delta (Hz)	Frequency Stability (ppm)
Condition		**F low @ -13dBm**	**F high @ -13dBm**		
Temperature	**Voltage**	**(MHz)**	**(MHz)**		
Normal (20C)	Normal	2496.9572	2689.0211		
Extreme (50C)		2496.9572	2689.0211	67.9	0.026
Extreme (40C)		2496.9572	2689.0211	83.1	0.032
Extreme (30C)		2496.9572	2689.0211	36.9	0.014
Extreme (10C)		2496.9572	2689.0211	-68.9	-0.027
Extreme (0C)		2496.9572	2689.0211	124.0	0.048
Extreme (-10C)		2496.9572	2689.0211	144.4	0.056
Extreme (-20C)		2496.9572	2689.0211	-87.5	-0.034
Extreme (-30C)		2496.9572	2689.0211	95.1	0.037
20C	15%	2496.9572	2689.0211	42.0	0.016
	-15%	2496.9572	2689.0211	45.0	0.017

QPSK, (20MHz + 20MHz BANDWIDTH)

Limit		2496	2690	Delta (Hz)	Frequency Stability (ppm)
Condition		**F low @ -13dBm**	**F high @ -13dBm**		
Temperature	**Voltage**	**(MHz)**	**(MHz)**		
Normal (20C)	Normal	2496.8919	2688.8944		
Extreme (50C)		2496.8919	2688.8944	-63.0	-0.024
Extreme (40C)		2496.8919	2688.8944	47.3	0.018
Extreme (30C)		2496.8919	2688.8944	164.8	0.064
Extreme (10C)		2496.8919	2688.8944	81.1	0.031
Extreme (0C)		2496.8919	2688.8944	-50.3	-0.019
Extreme (-10C)		2496.8919	2688.8944	66.8	0.026
Extreme (-20C)		2496.8919	2688.8944	53.7	0.021
Extreme (-30C)		2496.8919	2688.8944	60.6	0.023
20C	15%	2496.8919	2688.8944	57.0	0.022
	-15%	2496.8919	2688.8944	45.0	0.017
	End Point	2496.8919	2688.8944	-42.0	-0.016